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**THE NASA DIGITAL VGH PROGRAM -  
EXPLORATION OF METHODS AND FINAL RESULTS**

**Volume II - L 1011 Data 1978-1979: 1619 HOURS**

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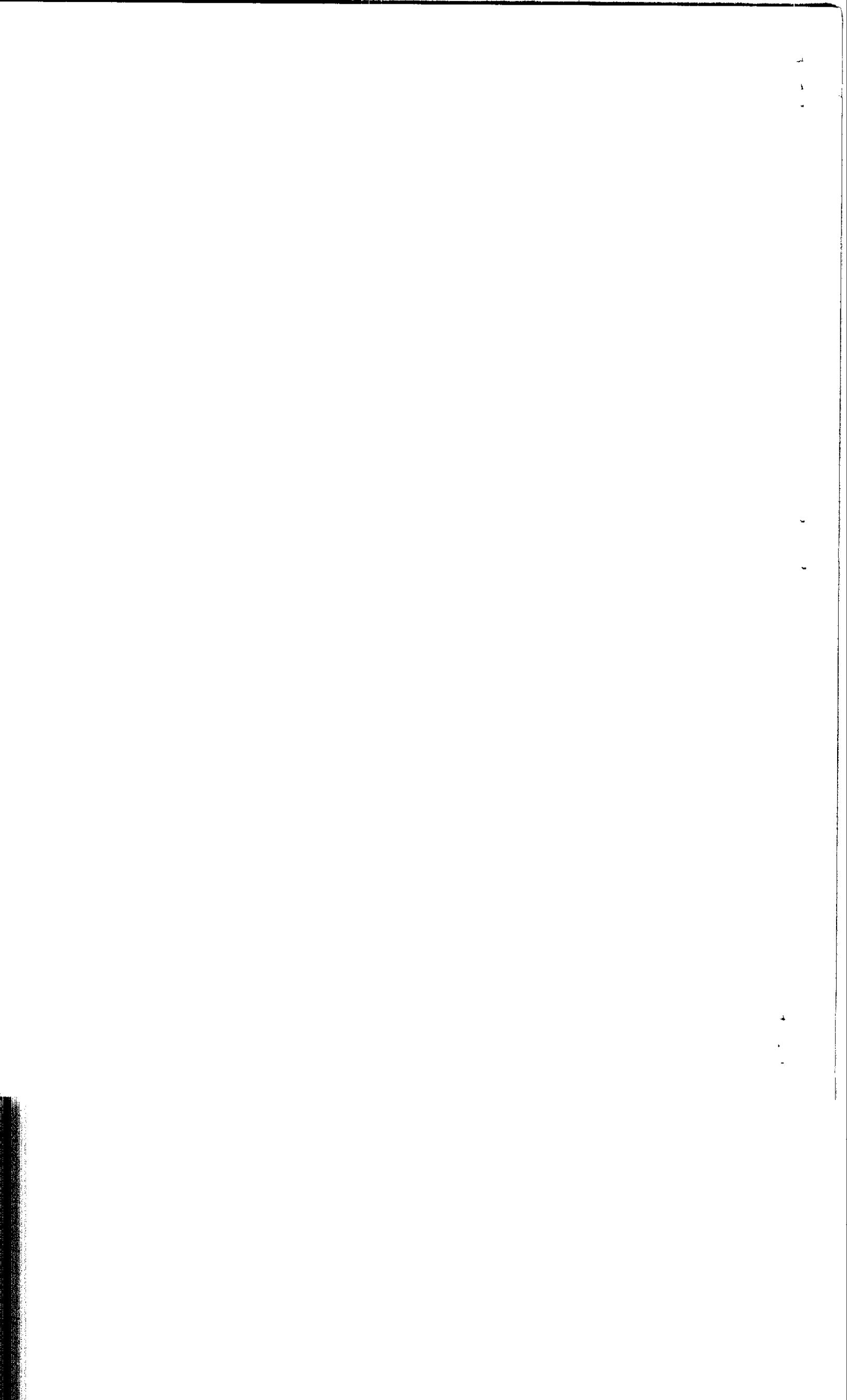
**Eagle Engineering, Incorporated  
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**Contract NASW 4430  
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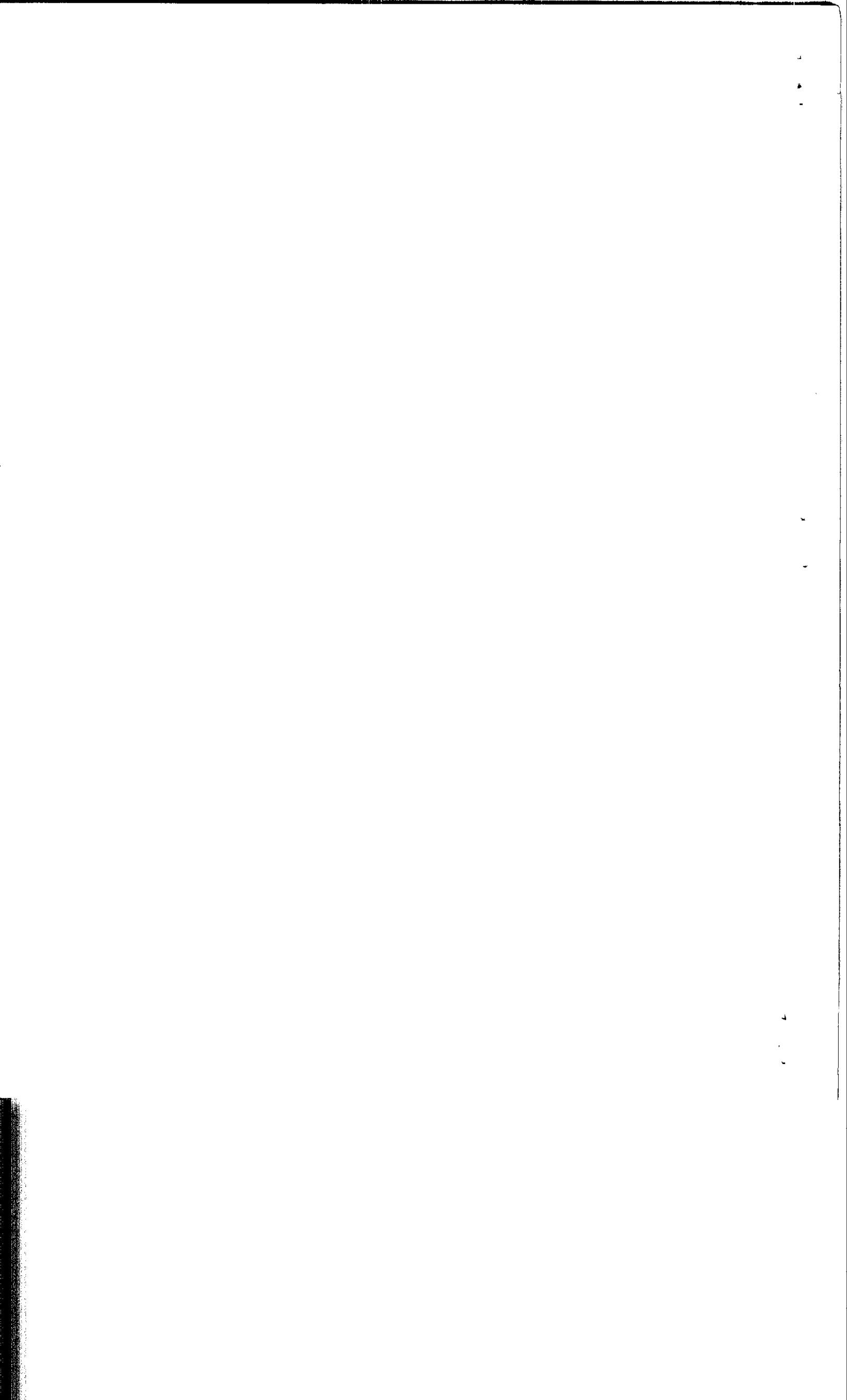
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## FOREWORD

This report was prepared by Eagle Engineering, Inc., Hampton Division, under contract NASW 4430, sponsored by NASA Langley Research Center and the Federal Aviation Administration Technical Center under the FAA-NASA Interagency Agreement No. DTFA03-890-A-00019 of 13 June 1989. This report fulfills the requirement of the Program Plan for the National Aging Aircraft Research Program, DOT/FAA/CT-88/32, August 1989, Paragraph 2.3.2.1, Flight Loads.

The Eagle Engineering, Inc. effort was performed by Norman L. Crabill and administered under the direction of Joseph W. Stickle (NASA Langley Research Center) and Thomas DeFiore (FAA Technical Center).



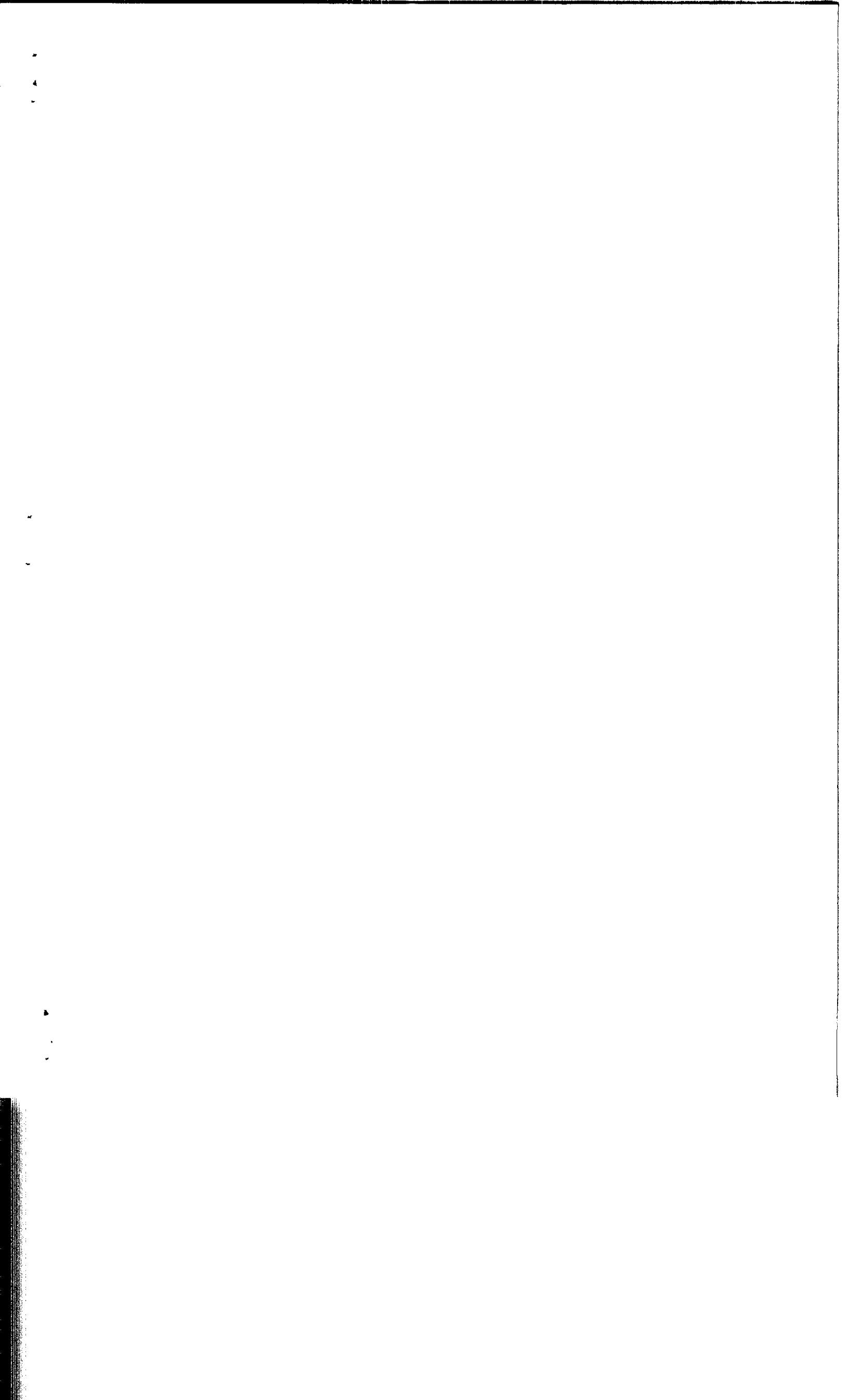
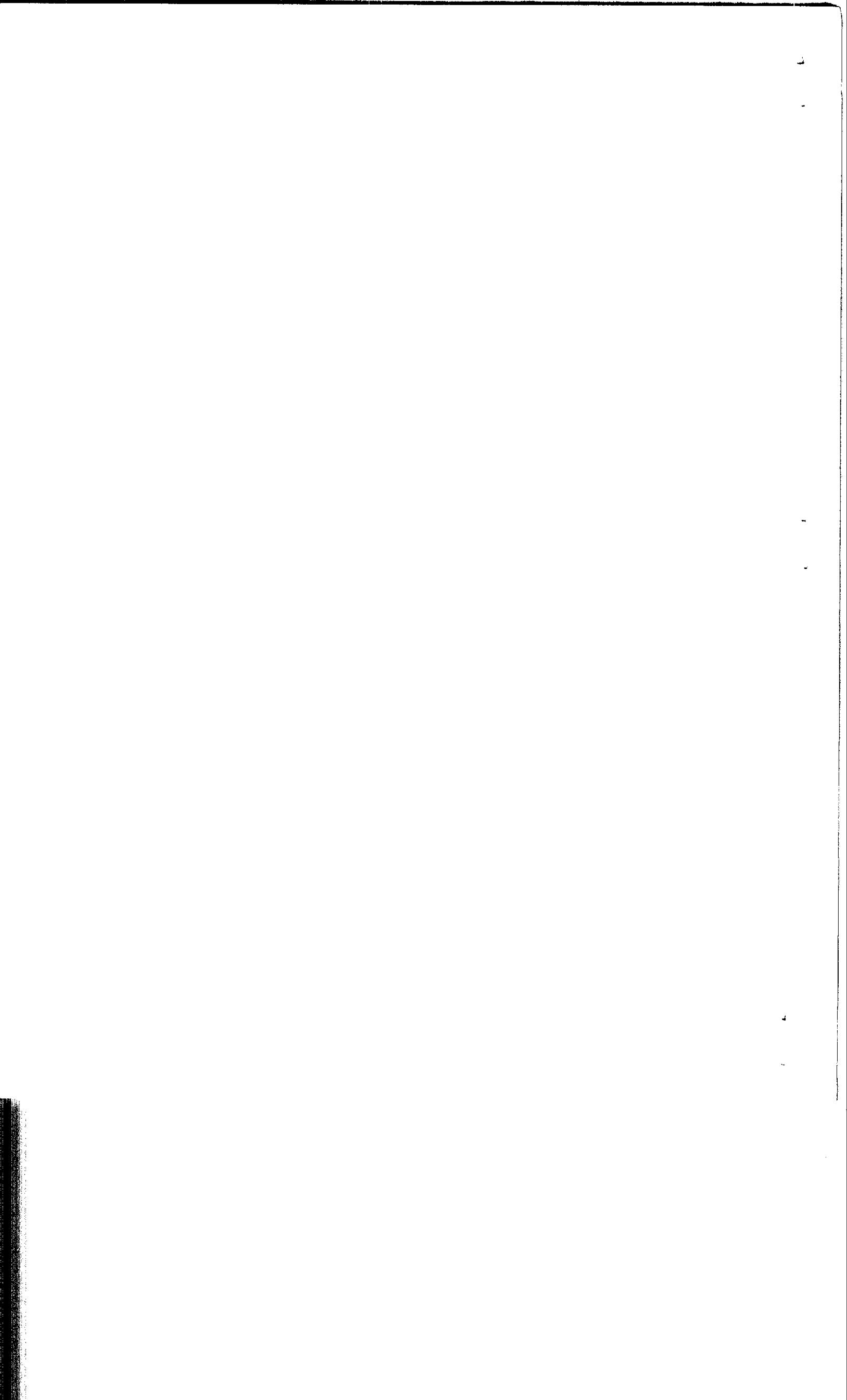


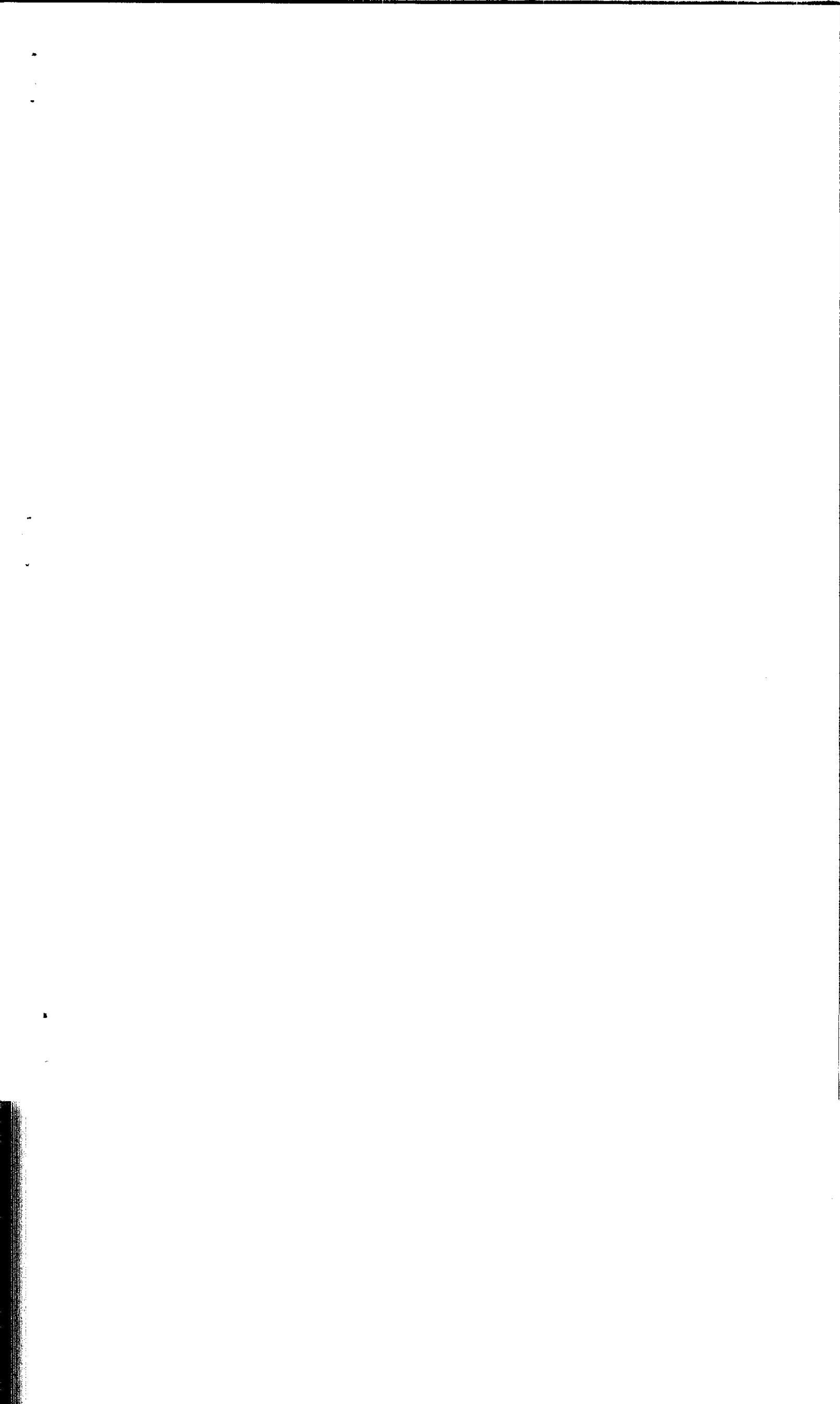


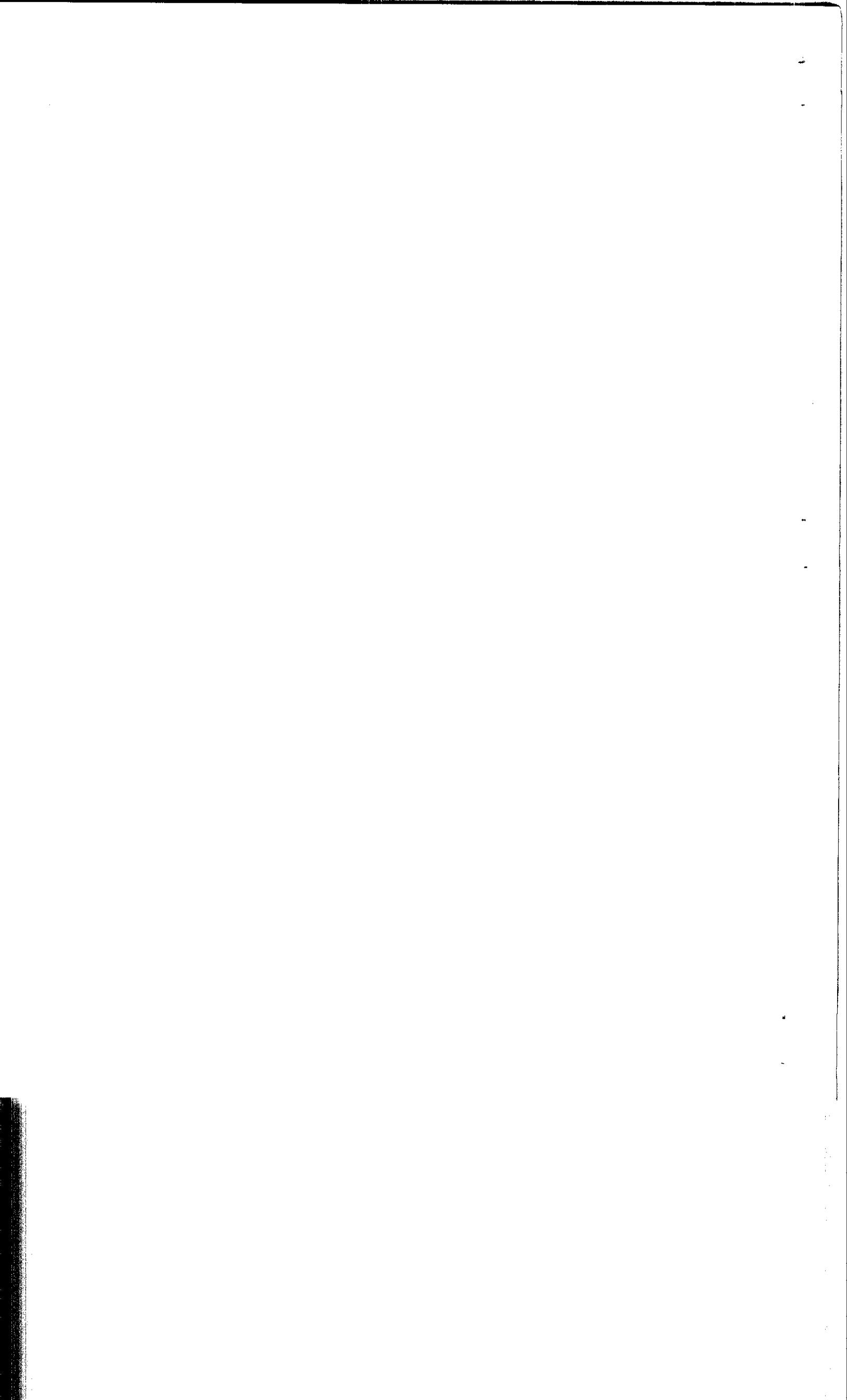
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THE NASA DIGITAL VGH PROGRAM-  
EXPLORATION OF METHODS AND FINAL RESULTS  
Volume II: L 1011 Data 1978-1979: 1619 Hours  
Norman L. Crabill  
Eagle Engineering, Inc.  
Hampton Division

#### SUMMARY

Data obtained from the Digital Flight Data Recorder system of a L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Data on conditions with flap deployment and autopilot use are given. In addition, acceleration statistics are presented from 23 hours on nonrevenue flights.

#### INTRODUCTION

This document presents the results of the NASA DVGH Program obtained during 1978-1979 operations of a Lockheed L 1011 aircraft. This volume is an extension of the work and methods documented in Volume I. The data reduction analysis and methods, and data presentation are essentially the same as those reported in Volume I. However, this report does contain additional data on autopilot usage and some limited acceleration-derived exceedance data obtained from non-revenue flights.

small amount (56 flights and 23 hours) was obtained during non-revenue service (ferry flights mainly, although some training and maintenance flights may have been included). As in Volume I, some gaps in the data exist due to faulty or missing records, etc., but this is believed to be small (less than 10 percent of the number of flights).

#### DATA REDUCTION PROCESS

The Data Reduction Process is basically the same as described in Volume I. The filter used to separate maneuver and gust accelerations was the same since the data are for the same type of aircraft described in Volume I. Although the results of reference 13 in Volume I indicate that the operation of the autopilot can cause up to a 20 percent reduction in the normal acceleration peak response to continuous turbulence, it was decided, after consultation with the industry, not to account for this in deriving  $U_{de}$ , in order to maintain comparability with the earlier VGH results, even though the autopilot status was being monitored in this investigation.

#### RESULTS

##### Flight Profile and Acceleration Derived Statistics

Presentation of Flight Profile Statistics results is similar to that described in Volume I. Flight Profile Statistics are given in Percent of Time, and as Maximum Values on a Percent of Flight basis for Entire Flights (flaps up or down) and for Flaps Deflected. For operations reported in this volume, the conditions

## AIRCRAFT AND INSTRUMENTATION

### Aircraft

The aircraft was a Lockheed L 1011 as in Volume I. Aircraft characteristics used in the analysis are given in Table I; the configuration is shown in figure 1 with the location of the accelerometers as indicated.

### Instrumentation

The data were obtained from the Digital Flight Data Recorder system described in Volume I. Measurements were:

<u>Parameter</u>	<u>Range and Units</u>	<u>Samples per Second</u>
$a_n + 1$	-3g to +6g	4
$a_y$	-1g to +1g	4
CAS	100 to 450 kts	1
HP	-1,000 to 50,000 ft	1
FLP	-5° to 60°	1
Autopilot Status	Off or On	Discrete

Note that Spoiler data are not reported here, although they were in Volume I.

### SCOPE OF DATA

Data were collected from a single aircraft operating in regular airline service over the service area shown in figure 2 during 1978 and 1979. Almost all of the data (914 flights and 1619 hours) were obtained during passenger-carrying revenue service; a

with autopilot off and on. It can be seen that the effect of the autopilot operation is to shift the gust response of aircraft to a higher frequency, that is from 0.35 Hz to 0.8 Hz in this example as predicted in reference 13. Reference 13 also indicates that another effect of the autopilot is a reduction in the gust response by 10 to 25 percent. However, these autopilot effects were not factored into the  $U_{de}$  transfer function in this analyses in order to maintain comparability with the previous VGH results.

#### CONCLUDING REMARKS

Data obtained from the Digital Flight Data Recorder system of an L 1011 aircraft in 914 flights and 1619 hours of airline revenue operations are presented as an extension of the work documented in Volume I of this report. Some new data on conditions with flap deployment and autopilot usage are given. In addition, acceleration statistics are presented from 23 hours on non-revenue flights. No general discussion of the data is presented.

existing during flap retraction after lift off, and the conditions existing during flap deflection before landing are given.

Acceleration Derived Statistics are also presented as in Volume I, except that with Flaps Deflected, the maximum  $a_n$  and Equivalent Airspeeds during that part of the flight are presented for the various flap detents in take off and landing. Also new are level crossing counts for the Acceleration Derived Quantities for non-revenue ferry, training, and maintenance flights. All other results are for revenue flights. The Acceleration Derived quantities are subject to the same limitations discussed in Volume I, which indicates that the exceedances derived from the DFDR system at 4 samples per second may be significantly less than if actual peak values were counted.

The detailed Flight Profile and Acceleration Derived Statistics are given in figures 3 through 24 as shown in Table II. No discussion of the data is presented.

#### Autopilot Usage

Autopilot status was monitored as off, or on, without regard to the exact on-mode. The altitudes for autopilot turn-on during climb, turn-off during descent, and percent-of-time and percent-of-flights it was on are given in figure 25. The characteristics of a low amplitude oscillation in normal acceleration that appears sporadically in cruise, as first reported in Volume I, are summarized in figure 26. This phenomenon is believed to be due to off-nominal autopilot operation in the altitude-hold mode. The presence of such a low-frequency resonance was predicted in reference 13. Figure 27 shows normal acceleration power spectra

TABLE II  
INDEX OF FLIGHT PROFILE AND ACCELERATION STATISTICS

FLIGHT PROFILE STATISTICS

o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
3	Weight vs. Flight Duration	12-17
4	Altitudes and Gross Weights	18
5	Altitudes and Airspeeds	19-22
6	Altitude Summary	23
7	Maximum Altitudes	24-25

o FLAPS DEFLECTED

8	Flap Detent Use	26
9	Weights, Altitudes and Airspeeds	27-33
10	Flap Deflection Times	34-36
11	Equivalent Airspeeds and Detents	37
12	Flap Use above 10,000 ft	38-39

TABLE I  
LOCKHEED L 1011-1 CHARACTERISTICS USED IN THE ANALYSIS

o Geometrical Characteristics

- o Wing Area  $S = 3456 \text{ ft}^2$
- o Wing Mean Chord = 22.3 ft

o Lift Curve Slope  $C_{l\alpha}$  per degree

Flaps up = f(M, HP)					Flaps Down = f(FLP)	
<u>M</u>	<u>HP = 0</u>	<u>10kft</u>	<u>20kft</u>	<u>40 kft</u>	<u>FLP, deg</u>	<u>HP = 0</u>
.20	.0923	.0928	.0929	.0936	0	.0925
.35	.0923	.0928	.0930	.0938	4	.0973
.50	.0913	.0920	.0929	.0946	10	.0980
.60	.0918	.0928	.0940	.0963	18	.0975
.70	.0940	.0954	.0970	.1003	22	.0971
.80	--	.1038	.1058	.1100	27	.0962
.89	--	.1210	.1240	.1305	33	.0948
.91	--	--	.1227	.1286	45	.0912
.95	--	--	.1030	.1081		

- o Weight was computed linearly with time from take off to landing as described in Appendix C in Volume I.

TABLE II (concluded)

19 Peak Positive and Negative  $U_{de}$  vs. Altitude

(a)	$U_{de}$ matrix	108
(b)-(k)	$U_{de}$ plots	109-118

## o FLAPS DEFLECTED

Figure Number	Subject	Page Numbers
20	$a_n$ Exceedances with Flaps Deflected	
(a)	Take Off Detents matrix	119
(b)	Take Off Detents plot	120
(c)	Landing Detents matrix	121
(d)	Landing Detents plot	122
21	Peak Positive and Negative $a_n$ per flight and EAS bands	
(a)-(d)	Take Off Detents	123-126
(e)-(k)	Landing Detents	127-133

## o NON-REVENUE FLIGHTS

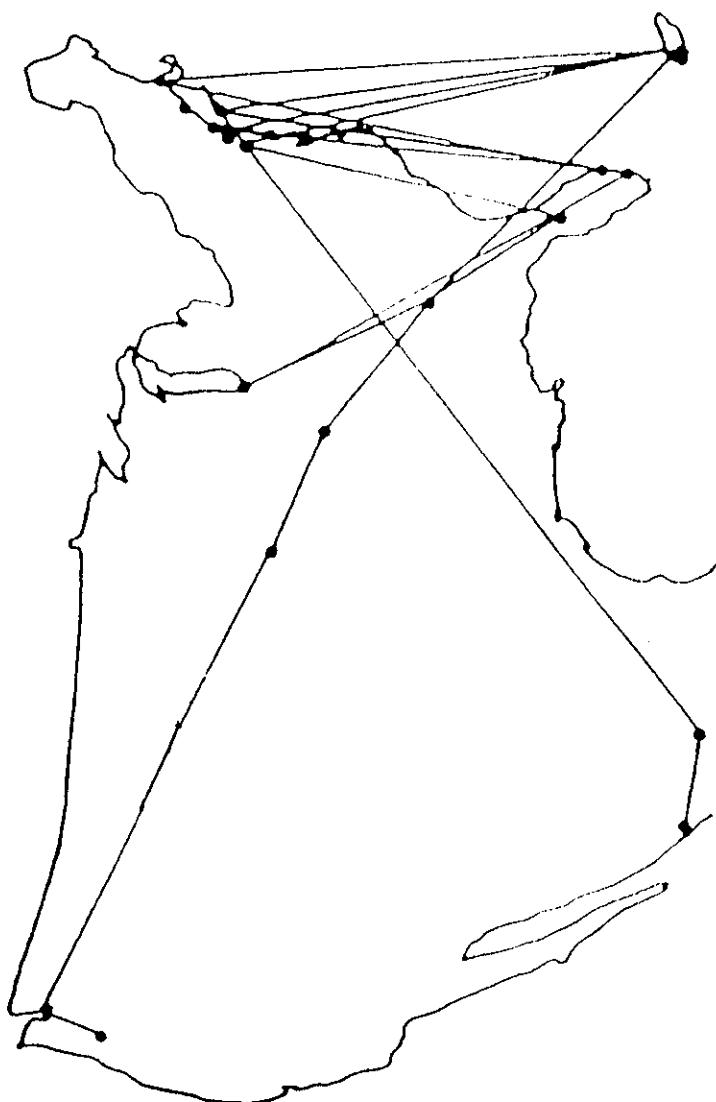
Figure Number	Subject	Page Numbers
22	Normal Acceleration Exceedances	
(a)	$a_n$ matrix	134
(b)	$a_{nM}$ matrix	135
(c)	$a_{nG}$ matrix	136
(d)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	137-146
23	Lateral Acceleration Exceedances	
(a)	$a_y$ matrix	147
(b)-(k)	$a_y$ plots	148-157
24	$U_{de}$ Exceedances	
(a)	$U_{de}$ matrix	158
(b)-(k)	$U_{de}$ plots	159-168

TABLE II (continued)

## ACCELERATION DERIVED STATISTICS

## o ENTIRE FLIGHTS

Figure Number	Subject	Page Numbers
<b>13 Normal Acceleration Exceedances</b>		
(a)	$a_n$ matrix	40
(b)	$a_{nM}$ matrix	41
(c)	$a_{nG}$ matrix	42
(d)-(k)	$a_n$ , $a_{nM}$ , $a_{nG}$ plots	43-52
<b>14 Lateral Acceleration Exceedances</b>		
(a)	$a_y$ matrix	53
(b)-(k)	$a_y$ plots	54-63
<b>15 <math>U_{de}</math> Exceedances</b>		
(a)	$U_{de}$ matrix	64
(b)-(k)	$U_{de}$ plots	65-74
<b>16 Peak Positive and Negative <math>a_n</math> vs. Altitude</b>		
(a)	$a_n$ matrix	75
(b)-(k)	$a_n$ plots	76-85
<b>17 Peak Positive and Negative <math>a_{nM}</math> vs. Altitude</b>		
(a)	$a_{nM}$ matrix	86
(b)-(k)	$a_{nM}$ plots	87-96
<b>18 Peak Positive and Negative <math>a_{nG}</math> vs. Altitude</b>		
(a)	$a_{nG}$ matrix	97
(b)-(k)	$a_{nG}$ plots	98-107



MARCH 1978 - JULY 1979

914 FLIGHTS

1619 HOURS

700,000 N. MILES

FIGURE 2.- Location of service area and scope of data.

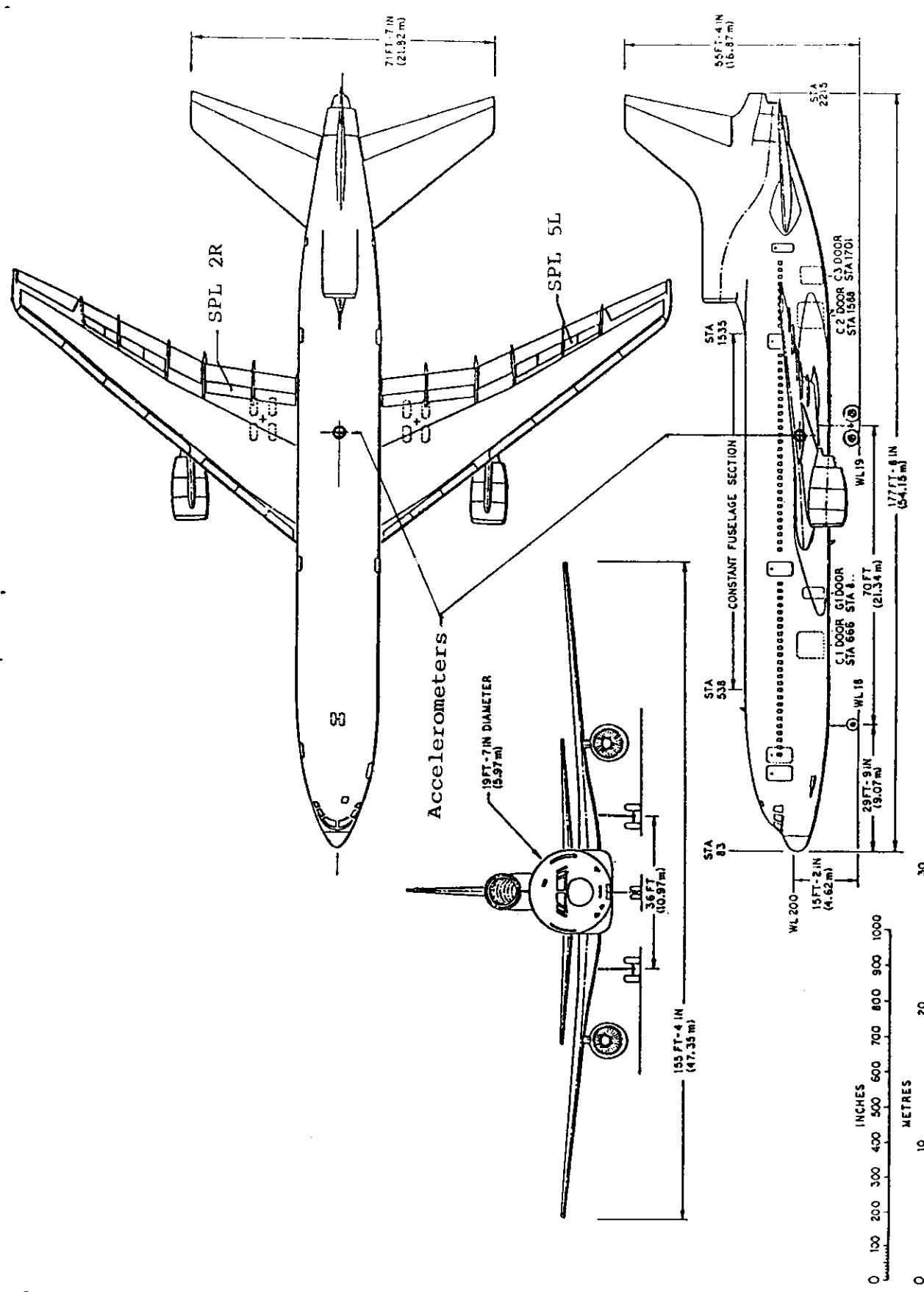


FIGURE 1.—Aircraft three-view with locations of accelerometers and spoilers.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	250 KIAMS	270 KIAMS	290 KIAMS	310 KIAMS	330 KIAMS	350 KIAMS	370 KIAMS	390 KIAMS	410 KIAMS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0.1	0.1	0.1	0.3	0.2	0
4.5-5.0	0	0	0.1	0.1	0.1	0.5	1.1	0.4	0
4.0-4.5	0	0	0	0.5	0.5	0.4	2.2	1.5	0.1
3.5-4.0	0	0	0	0	0.4	0.5	4.2	3.6	0.4
3.0-3.5	0	0	0.1	0.1	0.5	0.5	0.0	0.0	0.0
2.5-3.0	0	0	0.1	0.1	1.4	2.4	4.5	0.5	0.5
2.0-2.5	0	0	1.0	3.3	3.3	6.2	6.7	0.8	0
1.5-2.0	0	0.7	0.7	1.5	1.5	4.3	4.3	0.7	0
1.0-1.5	0	0.4	0.4	2.7	4.9	4.9	6.1	1.2	0
.8-1.0	0	0.2	0.2	0.4	3.2	3.2	2.0	0	0
.6-.8	0	0.1	1.5	1.5	1.4	1.4	1.2	0	0
.5-.6	0	0.3	0.3	2.3	2.3	2.2	1.3	0.5	0
.4-.5	0	0.8	0.8	2.2	2.2	2.1	1.3	0.2	0
.3-.4	0	0.5	0.5	2.5	2.1	2.1	1.1	0	0
.0-.3	0	0.2	0.2	0.5	0.7	0.7	0.1	0	0
TOTAL PERCENTS, ALL FLIGHTS	0	4.6	20.2	37.3	33.4	4.5	0	0	0

(b) Gross weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	250 TO 270 KIWS	270 TO 290 KIWS	290 TO 310 KIWS	310 TO 330 KIWS	330 TO 350 KIWS	350 TO 370 KIWS	370 TO 390 KIWS	390 TO 410 KIWS	410 TO 430 KIWS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0.1	0.1
4.5-5.0	0	0	0	0	0	0	0.1	0.1	0.2
4.0-4.5	0	0	0	0	0	0	0.2	0.8	1.0
3.5-4.0	0	0	0	0	0	0	0.7	1.3	1.6
3.0-3.5	0	0	0	0	0.1	0.1	1.5	3.8	3.0
2.5-3.0	0	0	0	0.1	0.8	1.9	3.4	2.6	0.2
2.0-2.5	0	0	0	1.3	3.9	6.2	4.9	0.5	0
1.5-2.0	0	0	0.1	1.1	3.6	3.9	2.5	0.1	0
1.0-1.5	0	0	0.5	2.4	4.9	6.0	1.5	0	0
.8-.1.0	0	0	0.2	1.4	2.7	1.4	0	0	0
.6-.8	0	0	0.5	1.9	1.2	0.7	0	0	0
.5-.6	0	0	1.4	2.2	2.2	0.9	0	0	0
.4-.5	0	0.3	1.6	2.6	1.4	0.5	0	0	0
.3-.4	0	0.3	1.9	2.5	1.5	0	0	0	0
.0-.3	0	0.2	0.5	0.7	0.1	0	0	0	0
<b>TOTAL PERCENTS, ALL FLIGHTS</b>	<b>0</b>	<b>0.9</b>	<b>6.9</b>	<b>16.2</b>	<b>22.5</b>	<b>24.1</b>	<b>18.5</b>	<b>9.3</b>	<b>1.6</b>

(a) Gross weight at take off

Figure 3.- Percent of flights: Weight vs duration.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	10 TO 30 KIAMS	30 TO 50 KIAMS	50 TO 70 KIAMS	70 TO 90 KIAMS	90 TO 110 KIAMS	110 TO 130 KIAMS	130 TO 150 KIAMS	150 TO 170 KIAMS	170 TO 190 KIAMS	190 TO
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0.2	0	0	0	0	0	0	0	0	0
4.5-5.0	0.2	0.5	0	0	0	0	0	0	0	0
4.0-4.5	1.1	1.0	0	0	0	0	0	0	0	0
3.5-4.0	2.3	2.0	0	0	0	0	0	0	0	0
3.0-3.5	4.0	4.8	0	0	0	0	0	0	0	0
2.5-3.0	4.2	4.4	0.4	0	0	0	0	0	0	0
2.0-2.5	11.3	5.0	0.7	0	0	0	0	0	0	0
1.5-2.0	4.6	5.5	1.3	0	0	0	0	0	0	0
1.0-1.5	5.4	9.1	1.0	0	0	0	0	0	0	0
.8-.1.0	1.4	3.8	0.5	0	0	0	0	0	0	0
.6-.8	1.1	2.5	0.7	0	0	0	0	0	0	0
.5-.6	1.6	3.6	0.9	0.5	0	0	0	0	0	0
.4-.5	1.0	4.4	1.0	0.2	0	0	0	0	0	0
.3-.4	1.1	3.7	1.4	0	0	0	0	0	0	0
.0-.3	0.3	0.7	0.5	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	39.8	51.0	8.4	0.8	0	0	0	0	0	0

(d) Fuel weight at landing

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	10 TO 30 KIWS	30 TO 50 KIWS	50 TO 70 KIWS	70 TO 90 KIWS	90 TO 110 KIWS	110 TO 130 KIWS	130 TO 150 KIWS	150 TO 170 KIWS	170 TO 190 KIWS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0.1	0.1	0	0
4.5-5.0	0	0	0	0	0	0.3	0.4	0	0
4.0-4.5	0	0	0	0	0	1.2	3.0	0.1	0
3.5-4.0	0	0	0	0	1.2	3.0	0.1	0	0
3.0-3.5	0	0	0	0	6.6	2.3	0	0	0
2.5-3.0	0	0	0	1.1	6.8	1.1	0	0	0
2.0-2.5	0	0	0	13.0	3.5	0.4	0	0	0
1.5-2.0	0	0.1	0.1	8.8	2.2	0.3	0	0	0
1.0-1.5	0	4.6	9.8	1.0	0	0	0	0	0
.8-1.0	0	3.2	2.2	0.4	0	0	0	0	0
.6-.8	0	2.3	2.0	0	0	0	0	0	0
.5-.6	0	4.0	2.0	0.7	0	0	0	0	0
.4-.5	0	4.4	2.0	0.2	0	0	0	0	0
.3--.4	0.2	3.9	2.1	0	0	0	0	0	0
.0--.3	0.3	0.7	0.5	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	0.5	23.2	43.4	22.5	9.3	1.0	0	0	0

(c) Fuel weight at take off

Figure 3.- Continued.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS									
	0 TO 20 KIAMS	20 TO 40 KIAMS	40 TO 60 KIAMS	60 TO 80 KIAMS	80 TO 100 KIAMS	100 TO 120 KIAMS	120 TO 140 KIAMS	140 TO 160 KIAMS	160 TO 180 KIAMS	180 TO
6.5-7.0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0.2	0	0	0	0	0	0	0	0
4.5-5.0	0.1	0.3	0.3	0	0	0	0	0	0	0
4.0-4.5	0.2	0.8	1.0	0.1	0	0	0	0	0	0
3.5-4.0	0	0.9	2.3	1.1	0	0	0	0	0	0
3.0-3.5	0.1	2.4	4.0	2.3	0	0	0	0	0	0
2.5-3.0	0.1	2.4	3.9	2.5	0	0	0	0	0	0
2.0-2.5	1.8	5.0	6.7	3.5	0	0	0	0	0	0
1.5-2.0	1.1	3.7	4.9	1.6	0	0	0	0	0	0
1.0-1.5	1.4	4.6	5.4	4.0	0	0	0	0	0	0
.8-1.0	0.4	2.0	3.2	0.2	0	0	0	0	0	0
.6-.8	1.3	1.5	1.1	0.3	0	0	0	0	0	0
.5-.6	2.8	1.8	1.8	0.3	0	0	0	0	0	0
.4-.5	2.6	2.6	1.2	0.1	0	0	0	0	0	0
.3-.4	2.8	2.5	0.8	0.1	0	0	0	0	0	0
.0-.3	1.1	0.2	0.2	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	16.0	31.0	36.8	16.3	0	0	0	0	0	0

(f) Payload weight vs flight duration.

Figure 3.- Concluded.

DURATION OF FLIGHT, HOURS	PERCENT OF FLIGHTS								
	0 TO 20 KLBS	20 TO 40 KLBS	40 TO 60 KLBS	60 TO 80 KLBS	80 TO 100 KLBS	100 TO 120 KLBS	120 TO 140 KLBS	140 TO 160 KLBS	160 TO 180 KLBS
6.5-7.0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0.2	0	0	0
4.5-5.0	0	0	0	0	0	0.5	0.2	0	0
4.0-4.5	0	0	0	0	0	2.0	0.1	0	0
3.5-4.0	0	0	0	0	0.8	3.5	0	0	0
3.0-3.5	0	0	0	0	7.9	1.0	0	0	0
2.5-3.0	0	0.7	8.3	0	0	0	0	0	0
2.0-2.5	0	13.7	3.3	0	0	0	0	0	0
1.5-2.0	0	11.3	0.1	0	0	0	0	0	0
1.0-1.5	5.9	9.5	0	0	0	0	0	0	0
.8-1.0	5.7	0.1	0	0	0	0	0	0	0
.6-.8	4.3	0	0	0	0	0	0	0	0
.5-.6	6.7	0	0	0	0	0	0	0	0
.4-.5	6.6	0	0	0	0	0	0	0	0
.3-.4	6.2	0	0	0	0	0	0	0	0
.0-.3	1.5	0	0	0	0	0	0	0	0
TOTAL PERCENTS, ALL FLIGHTS	36.9	35.2	20.4	7.0	0.5	0	0	0	0

(e) Fuel burn vs flight duration

Figure 3.- Continued.

CAS BAND, KTS	PRESSURE ALTITUDE BANDS									
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0	0	0	0	0	0	0	0	0	0
130-140	0	0	0	0	0	0	0	0	0	0
140-150	0.0001	0	0	0.0001	0	0	0	0	0	0.0001
150-160	0.0014	0.0003	0.0001	0	0	0	0	0	0	0.0018
160-170	0.0111	0.0011	0.0004	0	0	0	0	0	0	0.0126
170-180	0.0647	0.0028	0.0003	0	0	0	0	0	0	0.0678
180-190	0.1742	0.0048	0.0003	0	0	0	0	0	0	0.1792
190-200	0.2351	0.0045	0.0003	0	0	0	0	0	0	0.2398
200-210	0.2121	0.0077	0.0043	0.0017	0	0	0	0	0	0.2257
210-220	0.2292	0.0144	0.0032	0.0007	0	0	0	0	0	0.2475
220-230	0.2565	0.0350	0.0040	0.0007	0	0	0	0.0006	0	0.2968
230-240	0.1894	0.0875	0.102	0.0031	0.0008	0	0.0006	0	0	0.2926
240-250	0.1855	0.4576	0.0980	0.0096	0.0024	0	0.0014	0.0016	0.0075	0.0015
250-260	0.1952	0.7525	0.2293	0.0170	0.0040	0.0038	0.0057	0.0769	0.0122	1.2966
260-270	0.0582	0.1889	0.1632	0.0126	0.0047	0.0033	0.0231	0.3653	0.0031	0.8225
270-280	0.0242	0.0654	0.1602	0.0295	0.0132	0.0118	0.1180	0.7550	0	1.1872
280-290	0.0153	0.0446	0.1962	0.0830	0.0791	0.0936	0.7517	0.4611	0	1.7245
290-300	0.0143	0.0831	0.5243	0.7714	0.9290	1.2477	1.7773	0.0621	0	5.4092
300-310	0.0165	0.1335	0.6549	0.8712	1.0971	1.5036	1.3085	0.0006	0	5.5859
310-320	0.0791	0.0644	0.1914	0.2392	0.2831	0.3620	0.2172	0	0	1.3644
320-330	0.0031	0.0249	0.0811	0.1005	0.1112	0.1429	0.0266	0	0	0.4903
330-340	0.0005	0.0136	0.0441	0.0514	0.0532	0.0699	0.0011	0	0	0.2339
340-350	0	0.0138	0.0328	0.0415	0.0426	0.0382	0	0	0	0.1689
350-360	0	0.0079	0.0225	0.0323	0.0226	0.0045	0	0	0	0.0899
360-370	0	0.0002	0.0070	0.0072	0.0008	0.0002	0	0	0	0.0154
370-380	0	0	0.0014	0.0003	0	0	0	0	0	0.0018
380-390	0	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	222.1913	261.9649	291.8472	303.6753	304.1234	303.6186	296.7216	275.2610	255.9756	
TOTAL HRS IN ALT. & CLIMB	30.6635	32.5208	39.3414	36.7997	42.8065	56.4105	68.5331	28.1487	0.2733	335.4975
PERCENT TIME, IN ALT. & CLIMB	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169	20.7194
									TOTAL FLIGHTS TOTAL HOURS	914 1619.2

(a) Climb

Figure 5.- Percent time in altitude and airspeed bands.

PRESSURE ALTITUDE BANDS

GROSS WEIGHT KLBS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT		14500 TO 19500 FT		19500 TO 24500 FT		24500 TO 29500 FT		29500 TO 34500 FT		34500 TO 39500 FT		39500 TO 44500 FT		-500 TO 44500 FT	
			TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT
<b>***CLIMB***</b>																		
250-270	0	0	0	0	0.0097	0.0056	0.0026	0.0006	0	0	0	0	0	0	0	0	0	0
270-290	0.0163	0.0163	0.1176	0.1176	0.1110	0.0812	0.0547	0.0447	0.0499	0.0413	0.0413	0.0413	0.0413	0.0413	0.0413	0.0413	0.0413	0.0347
290-310	0.1037	0.1037	0.3059	0.3059	0.3629	0.3093	0.2591	0.2045	0.1718	0.1069	0.1069	0.1069	0.1069	0.1069	0.1069	0.1069	0.1069	0.6140
310-330	0.2663	0.2663	0.4321	0.4321	0.5335	0.4886	0.5379	0.6953	0.8288	0.2901	0.2901	0.2901	0.2901	0.2901	0.2901	0.2901	0.2901	2.6961
330-350	0.4056	0.4056	0.5076	0.5076	0.6480	0.6441	0.8088	1.1113	1.4090	0.4155	0.4155	0.4155	0.4155	0.4155	0.4155	0.4155	0.4155	4.3373
350-370	0.4645	0.4645	0.4014	0.4014	0.4882	0.4780	0.6133	0.8607	1.0575	0.2857	0.2857	0.2857	0.2857	0.2857	0.2857	0.2857	0.2857	6.2650
370-390	0.3895	0.3895	0.1971	0.1971	0.2363	0.2370	0.2925	0.3668	0.3950	0.0342	0.0342	0.0342	0.0342	0.0342	0.0342	0.0342	0.0342	4.5713
390-410	0.2076	0.2076	0.0371	0.0371	0.0441	0.0320	0.0367	0.0279	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	0.0157	1.9664	
410-430	0.0381	0.0381	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2316
PERCENT TOTAL TIME =	1.8937	2.0084	2.4296	2.2726	2.6436	3.4838	4.2324	1.7384	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	0.0169	20.7194	
AVE GROSS WEIGHT IN ALTITUDE BAND	355.78	354.74	355.71	357.25	360.05	360.54	359.83	351.19	308.23									
<b>***LEVEL***</b>																		
250-270	0	0	0.1229	0.0305	0.0081	0.0110	0.0069	0.0050	0.0050	0	0	0	0	0	0	0	0	0.3141
270-290	0.0493	0.0493	0.2475	0.2592	0.0722	0.1831	0.1105	0.0804	0.17220	0.1396	0.1396	0.1396	0.1396	0.1396	0.1396	0.1396	0.1396	3.0158
290-310	0.2012	0.2012	0.3934	0.3934	0.6388	0.2421	0.1971	0.3003	0.6058	7.5552	0.0244	0.0244	0.0244	0.0244	0.0244	0.0244	0.0244	10.3509
310-330	0.3938	0.3938	0.4346	0.4346	0.4546	0.2157	0.2765	0.4818	2.1031	14.0693	0	0	0	0	0	0	0	19.1359
330-350	0.3632	0.3632	0.0807	0.1402	0.0763	0.1035	0.4437	3.7598	14.1293	0	0	0	0	0	0	0	0	18.7994
350-370	0.0559	0.0559	0.0201	0.0201	0.0022	0	0.0045	0.1727	3.0682	4.3582	0	0	0	0	0	0	0	7.8258
370-390	0	0	0.0016	0.0016	0.0055	0.0014	0	0.0011	0	0.7742	0.5306	0	0	0	0	0	0	1.3145
390-410	0	0	0.0012	0	0	0	0	0	0.0797	0	0	0	0	0	0	0	0	0.0810
410-430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERCENT TOTAL TIME =	1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751	0.1751	0.1751	0.1751	0.1751	0.1751	0.1751	0.1751	60.8373	
AVE GROSS WEIGHT IN ALTITUDE BAND	323.75	322.92	325.60	329.11	327.62	343.26	362.44	346.29	301.53									
<b>***DESCENT***</b>																		
250-270	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270-290	0.2089	0.1166	0.0487	0.0294	0.0250	0.0218	0.0269	0.0153	0.0153	0	0	0	0	0	0	0	0	0.4945
290-310	0.8501	0.6147	0.4338	0.2600	0.2120	0.2045	0.1718	0.1069	0.1069	0	0	0	0	0	0	0	0	2.8546
310-330	1.6165	1.1890	0.9742	0.5359	0.5453	0.5677	0.5677	0.5678	0.5678	0	0	0	0	0	0	0	0	6.3125
330-350	1.5097	1.2241	1.0460	0.7301	0.6966	0.7383	0.7383	0.7383	0.7383	0	0	0	0	0	0	0	0	6.8953
350-370	0.2186	0.2113	0.2584	0.2216	0.2430	0.2725	0.2725	0.2725	0.2725	0	0	0	0	0	0	0	0	1.8212
370-390	0	0.0023	0.0025	0.0019	0.0019	0.0115	0.0257	0.0186	0.0186	0	0	0	0	0	0	0	0	0.0644
390-410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0009
410-430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PERCENT TOTAL TIME =	4.4038	3.3580	2.7577	1.8789	1.7238	1.8194	1.7509	0.7483	0.7483	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	0.0026	18.4433
AVE GROSS WEIGHT IN ALTITUDE BAND	323.08	324.80	327.49	329.16	330.75	331.83	333.45	329.03	285.62									

$$\text{PERCENT TIME} = \frac{\text{HOURS IN ALTITUDE \& CLIMB (LEVEL, DESCENT) \& GROSS WEIGHT BANDS}}{\text{TOTAL TIME, HOURS}} \times 100$$

$$\frac{\text{TOTAL FLIGHTS}}{\text{TOTAL AIRTIME}} \frac{\text{TOTAL TIME}}{\text{TOTAL AIRTIME}} \frac{914}{708383.64} = 1619.24$$

Figure 4.- Percent time in altitude and gross weight bands.

		PRESSURE ALTITUDE BANDS								
CAS BAND KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0105	0.0009	0	0	0	0	0	0	0	0.0115
130-140	0.2221	0.0076	0	0	0	0	0	0	0	0.2297
140-150	0.8841	0.0128	0	0	0	0	0	0	0	0.8970
150-160	0.8058	0.0339	0.0021	0	0	0	0	0	0	0.4118
160-170	0.5278	0.0976	0.043	0	0	0	0	0	0	0.6298
170-180	0.3724	0.1697	0.0135	0	0	0	0	0	0	0.5557
180-190	0.2995	0.1762	0.0211	0	0	0	0	0	0	0.1968
190-200	0.1979	0.1382	0.0172	0.0004	0	0	0	0	0	0.3537
200-210	0.1789	0.2093	0.0391	0.0008	0	0	0	0	0	0.4280
210-220	0.1887	0.3161	0.0822	0.0068	0.0029	0	0	0	0	0.5967
220-230	0.1289	0.2039	0.0479	0.0152	0.0071	0.0008	0.0013	0	0	0.049
230-240	0.1149	0.2058	0.0680	0.0229	0.0181	0.0049	0.0031	0	0	0.4378
240-250	0.1522	0.5020	0.2034	0.0404	0.0350	0.0190	0.0043	0.0011	0	0.5574
250-260	0.1170	0.6136	0.2629	0.0803	0.0339	0.0209	0.0066	0.0021	0	1.1484
260-270	0.0334	0.1313	0.1011	0.0193	0.0165	0.0161	0.0177	0.0055	0	0.0119
270-280	0.0243	0.0563	0.0821	0.0214	0.0168	0.0161	0.0284	0.1287	0	0.3741
280-290	0.0252	0.0469	0.0809	0.0344	0.0247	0.0201	0.0557	0.2634	0	0.5512
290-300	0.0224	0.0385	0.1000	0.0870	0.0637	0.0457	0.1956	0.2382	0	0.7911
300-310	0.0184	0.0394	0.1317	0.0799	0.0767	0.0661	0.4186	0.0400	0	0.8708
310-320	0.0199	0.0437	0.1366	0.0687	0.0646	0.0941	0.4617	0.0001	0	0.8894
320-330	0.0184	0.0523	0.1641	0.0916	0.0655	0.1980	0.3941	0	0	0.9840
330-340	0.0202	0.0676	0.2276	0.1505	0.1125	0.4107	0.1557	0	0	1.1447
340-350	0.0160	0.0926	0.3207	0.2920	0.2314	0.4843	0.0081	0	0	1.4452
350-360	0.0045	0.0706	0.3782	0.4605	0.4040	0.3109	0	0	0	1.6289
360-370	0.0002	0.0295	0.2544	0.3793	0.5002	0.094	0	0	0	1.2630
370-380	0	0.0014	0.0183	0.0275	0.0501	0.0122	0	0	0	0.1095
380-390	0	0	0	0	0.0002	0	0	0	0	0.0003
390-400	0	0	0	0	0	0	0	0	0	0
AV CAS	179.8910	240.3053	304.3755	333.4549	339.8685	334.8912	311.8291	285.2743	257.0915	
TOTAL HRS IN ALT. & DESCENT	71.3083	54.3736	44.6533	30.4234	27.9122	29.4610	28.3508	12.1172	0.0425	298.6423
PERCENT TIME IN ALT. & DESCENT	4.4038	3.3580	2.7577	1.8789	1.7238	1.8194	1.7509	0.7483	0.0026	18.4433
TOTAL FLIGHTS									914	
TOTAL HOURS									1619.2	

(c) Descent

Figure 5.- Continued.

		PRESSURE ALTITUDE BANDS									
CAS BAND	KTS	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
120-130	0.0001	0	0	0	0	0	0	0	0	0	0.0001
130-140	0.0011	0.0002	0	0	0	0	0	0	0	0	0.0013
140-150	0.0105	0.0017	0	0	0	0	0	0	0	0	0.0122
150-160	0.0741	0.0032	0.0010	0	0	0	0	0	0	0	0.0784
160-170	0.1836	0.0230	0.0007	0	0	0	0	0	0	0	0.2073
170-180	0.1564	0.0439	0.0078	0	0	0	0	0	0	0	0.2080
180-190	0.1307	0.0395	0.0053	0	0	0	0	0	0	0	0.1755
190-200	0.0516	0.0169	0.0036	0	0	0	0	0	0	0	0.0721
200-210	0.0539	0.0939	0.0242	0.0002	0	0	0	0	0	0	0.1722
210-220	0.0700	0.1691	0.1152	0.0010	0	0	0	0	0	0	0.3554
220-230	0.0541	0.0752	0.0817	0.0011	0.0067	0	0	0	0.0040	0	0.2229
230-240	0.0510	0.0645	0.0689	0.0025	0.0583	0.0135	0.0026	0.0165	0	0	0.2779
240-250	0.0641	0.2159	0.1361	0.0125	0.0126	0.0103	0.0039	0.0502	0.0062	0	0.5119
250-260	0.0792	0.2874	0.1978	0.0138	0.0253	0.0096	0.0014	0.2037	0.1684	0	0.9867
260-270	0.0234	0.1047	0.1048	0.0049	0.0092	0.0056	0.0034	3.1522	0.0004	0	3.4087
270-280	0.0113	0.0293	0.0768	0.0037	0.0138	0.0045	0.0168	15.0436	0	0	15.1998
280-290	0.0092	0.0210	0.0753	0.0062	0.0061	0.0063	0.0482	12.2956	0	0	12.4680
290-300	0.0085	0.0253	0.0770	0.0127	0.0093	0.0144	0.8929	12.6007	0	0	13.6407
300-310	0.0071	0.0201	0.0879	0.0122	0.0170	0.0310	6.6572	0.0041	0	0	6.8366
310-320	0.0057	0.0145	0.0960	0.0147	0.0303	0.0820	2.2265	0	0	0	2.4698
320-330	0.0113	0.0102	0.0918	0.0355	0.0547	0.4939	0.6232	0	0	0	1.3207
330-340	0.0114	0.0137	0.0789	0.0821	0.1047	0.5902	0.0002	0	0	0	0.8812
340-350	0.0064	0.0139	0.0816	0.1437	0.1626	0.1791	0	0	0	0	0.5872
350-360	0	0.0153	0.0666	0.1881	0.1817	0.0598	0	0	0	0	0.5226
360-370	0	0.0024	0.0446	0.0778	0.0827	0.0057	0	0	0	0	0.2131
370-380	0	0	0.0033	0.0017	0.0020	0	0	0	0	0	0.0070
380-390	0	0	0	0	0	0	0	0	0	0	0
390-400	0	0	0	0	0	0	0	0	0	0	0
AV CAS	204.1130	242.0146	279.7108	338.9914	327.6451	329.2281	307.2635	282.7732	254.6686		
TOTAL HRS IN ALT. & LEVEL		17.4081	21.1458	24.7247	9.9497	12.5792	24.5475	169.6369	702.2781	2.8350	985.1050
PERCENT TIME IN ALT. & LEVEL		1.0751	1.3059	1.5269	0.6145	0.7769	1.5160	10.4763	43.3707	0.1751	60.8373
									TOTAL FLIGHTS	914	
									TOTAL HOURS	1619.2	

(b) Level

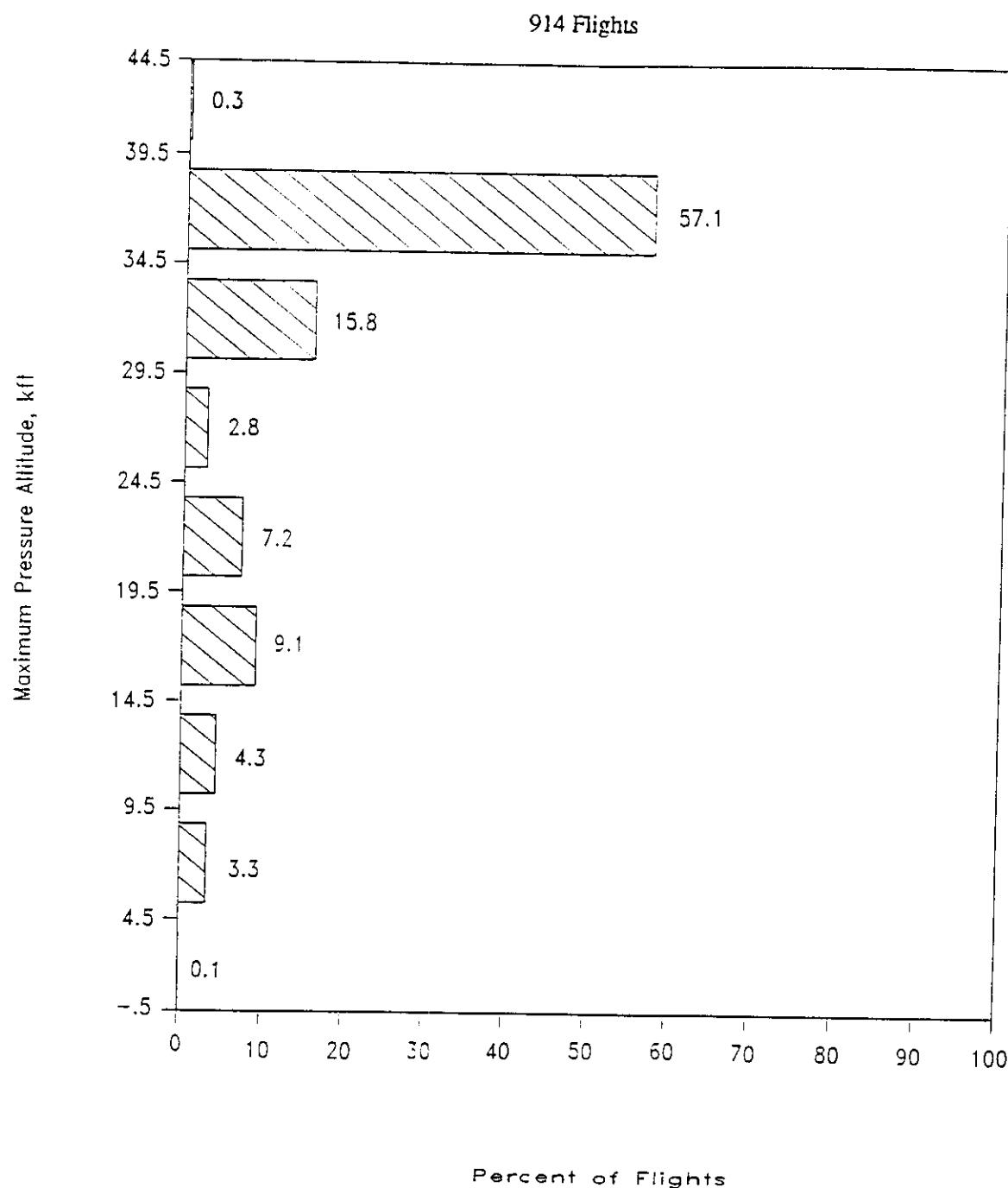
Figure 5.- Continued.

TIME INTERVAL IN ALT. BAND	TOTAL HOURS IN ALT. BAND	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS	TOTAL HOURS
		-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT			
6.50-7.00	0	0	0	0	0	0	0	0	0	0	0	0	0
6.00-6.50	0	0	0	0	0	0	0	0	0	0	0	0	0
5.50-6.00	0	0	0	0	0	0	0	0	0	0	0	0	0
5.00-5.50	0	0	0	0	0	0	0	0	0	0	0	0	0
4.50-5.00	0	0	0	0	0	0	0	0	0	0	0	0	0
4.00-4.50	0	0	0	0	0	0	0	0	0	0	0	0	0
3.50-4.00	0	0	0	0	0	0	0	0	0	0	0	0	0
3.00-3.50	0	0	0	0	0	0	0	0	0	0	0	0	0
2.50-3.00	0	0	0	0	0	0	0	0	0	0	0	0	0
2.00-2.50	0	0	0	0	0	0	0	0	0	0	0	0	0
1.50-2.00	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00-1.50	0	0.109	0	0	0	0	0	0	0	0	0	0	0
.90-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0
.80-.90	0	0.109	0	0	0	0.109	0	0.109	0	0	0.766	4.048	0
.70-.80	0	0.109	0	0	0	0	0	0	0	0	2.626	8.425	0
.60-.70	0	0	0.109	0	0	0	0	0.109	0	0	0.985	7.768	0
.50-.60	0.109	0.109	0	0	0	0	0	0	0	0.547	2.845	15.755	0.219
.45-.50	0	0	0	0	0	0	0	0	0	0	1.313	0.985	0
.40-.45	0.109	0	0.328	0	0	0	0.109	0	0.219	0	1.532	1.969	0
.35-.40	0.219	0.109	0	0	0	0	0	0.109	0	0	0.985	1.641	0
.30-.35	0.547	0.438	0.328	0	0	0	0	0	0	0	0.875	2.626	0
.25-.30	1.532	0.875	0.766	0.766	0	0	0.438	0.219	0	0	0.985	2.298	0.109
.20-.25	4.267	4.376	3.173	1.422	2.079	0	0.547	0	0	0	0.656	2.626	0
.15-.20	16.849	10.832	19.365	3.173	4.923	0	0.656	1.204	0	0	1.422	1.313	0
.10-.15	53.282	36.433	37.856	14.770	30.197	0	0.109	0	0	0	0	0	0
.05-.10	21.991	46.171	34.354	71.444	45.295	7.659	0	0	0	0	0	0	0
.00-.05	1.094	0.219	0.328	0.766	0	0	0	0	0	0	0	0	0
TOTAL HOURS IN ALT. BAND	119.3799	108.0403	108.7194	77.1728	83.2978	110.4190	266.5208	742.5439	3.1508				
TOTAL PERCENT TIME IN ALT. BAND	7.3726	6.6723	6.7142	4.7660	5.1442	6.8192	16.4596	45.8574	0.1946				

Figure 6.- Percent of flights that spend indicated time in pressure altitude bands.

**Figure 5.- Concluded.**

(d) All flight modes



(b) Percent of flights to maximum pressure altitude per flight : plot

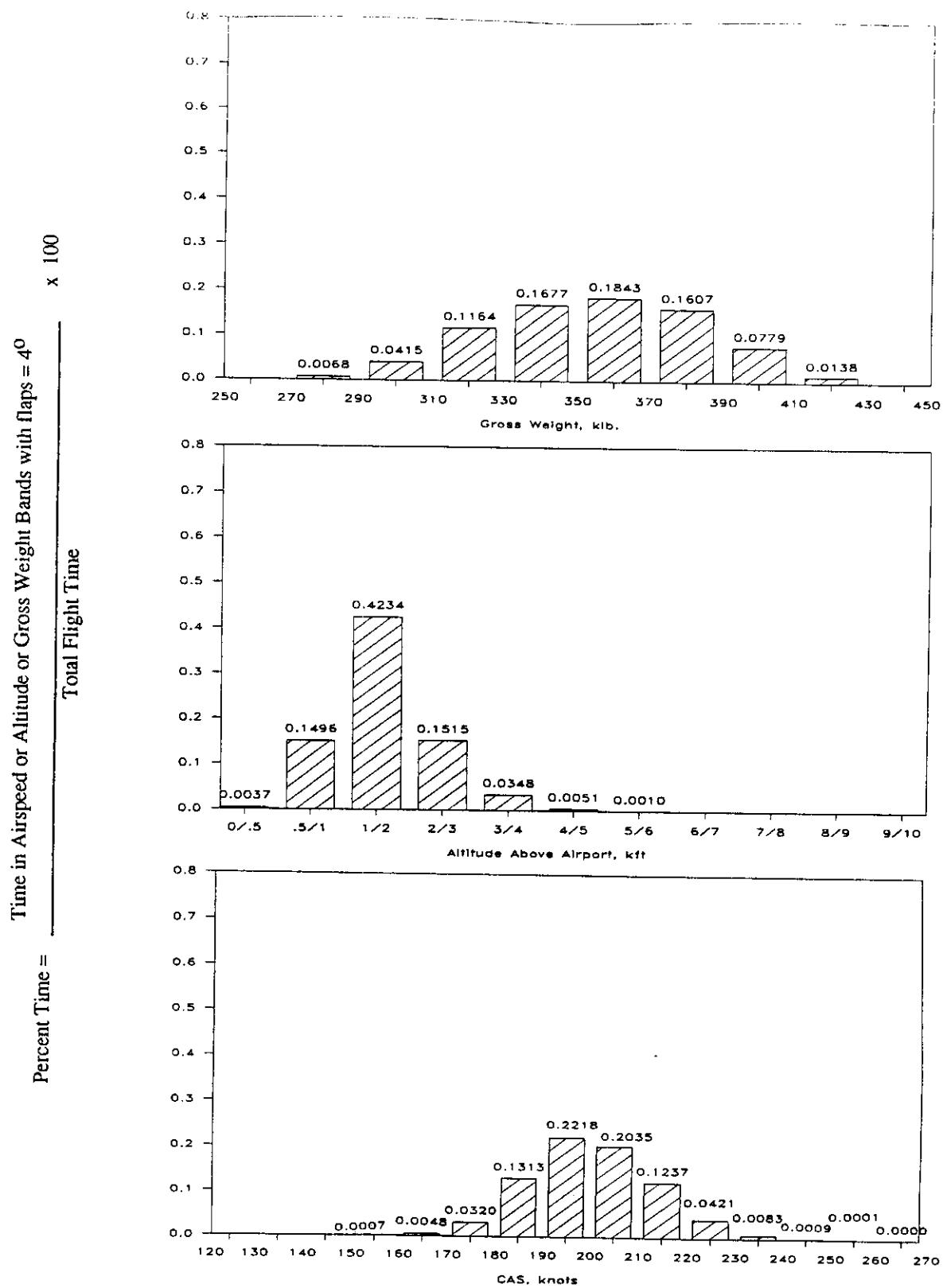
Figure 7.- Concluded.

DURATION OF FLIGHT, HOURS	-500 TO 4500 FT		4500 TO 9500 FT		9500 TO 14500 FT		14500 TO 19500 FT		19500 TO 24500 FT		24500 TO 29500 FT		29500 TO 34500 FT		34500 TO 39500 FT		39500 TO 44500 FT	
	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT	TO	FT
6.5-7.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.0-6.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.5-6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.0-5.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
4.5-5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0
4.0-4.5	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	2.0	0	0	0
3.5-4.0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	3.8	0	0	0
3.0-3.5	0	0	0	0	0	0	0	0	0	0	0	0	1.0	0	7.9	0	0	0
2.5-3.0	0	0	0	0	0	0	0	0	0	0	0.1	0	2.4	0	6.5	0	0	0
2.0-2.5	0	0	0	0	0	0.1	0	0	0	0	0.1	0	1.3	0	15.2	0.2	0	0
1.5-2.0	0	0	0	0	0	0	0	0	0	0	0.3	0	2.1	0	8.9	0.1	0	0
1.0-1.5	0	0.1	0	0	0	0	0	0	0	0	0.9	0	4.0	0	10.4	0	0	0
.8-1.0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0.7	0	3.6	1.4	0	0
.6-.8	0	0	0	0.1	0	0.1	0	1.5	0	1.5	0.5	0.5	0.7	0.1	0	0	0	0
.5-.6	0	0	0	0.1	0	0.1	1.2	0	5.0	0.2	0.2	0.1	0	0	0	0	0	0
.4-.5	0	0.7	1.3	0	3.7	0.9	0	0	0	0	0	0	0	0	0	0	0	0
.3-.4	0	1.5	2.3	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0
.0-.3	0.1	1.0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL PERCENT ALL FLIGHTS	0.1	3.3	4.3	9.1	7.2	2.8	15.8	57.1	0.3									

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(a) Maximum altitude vs flight duration - matrix

Figure 7.- Percent of flights to maximum pressure altitude.



(a) Take off, flaps =  $4^{\circ}$ ; 12.4544 hours

Figure 9.- Gross weight, altitude above airport, and airspeed percent time distributions.

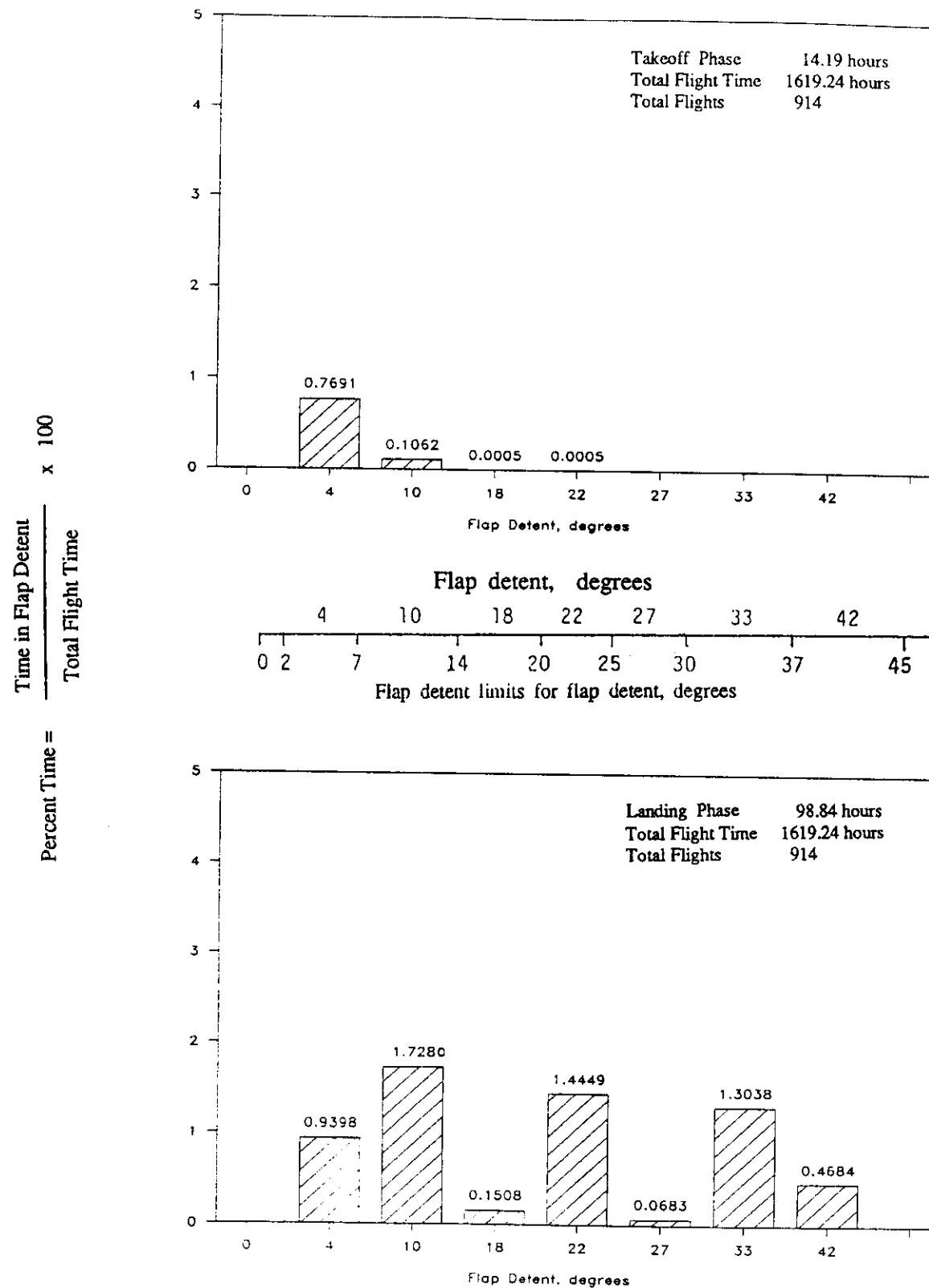
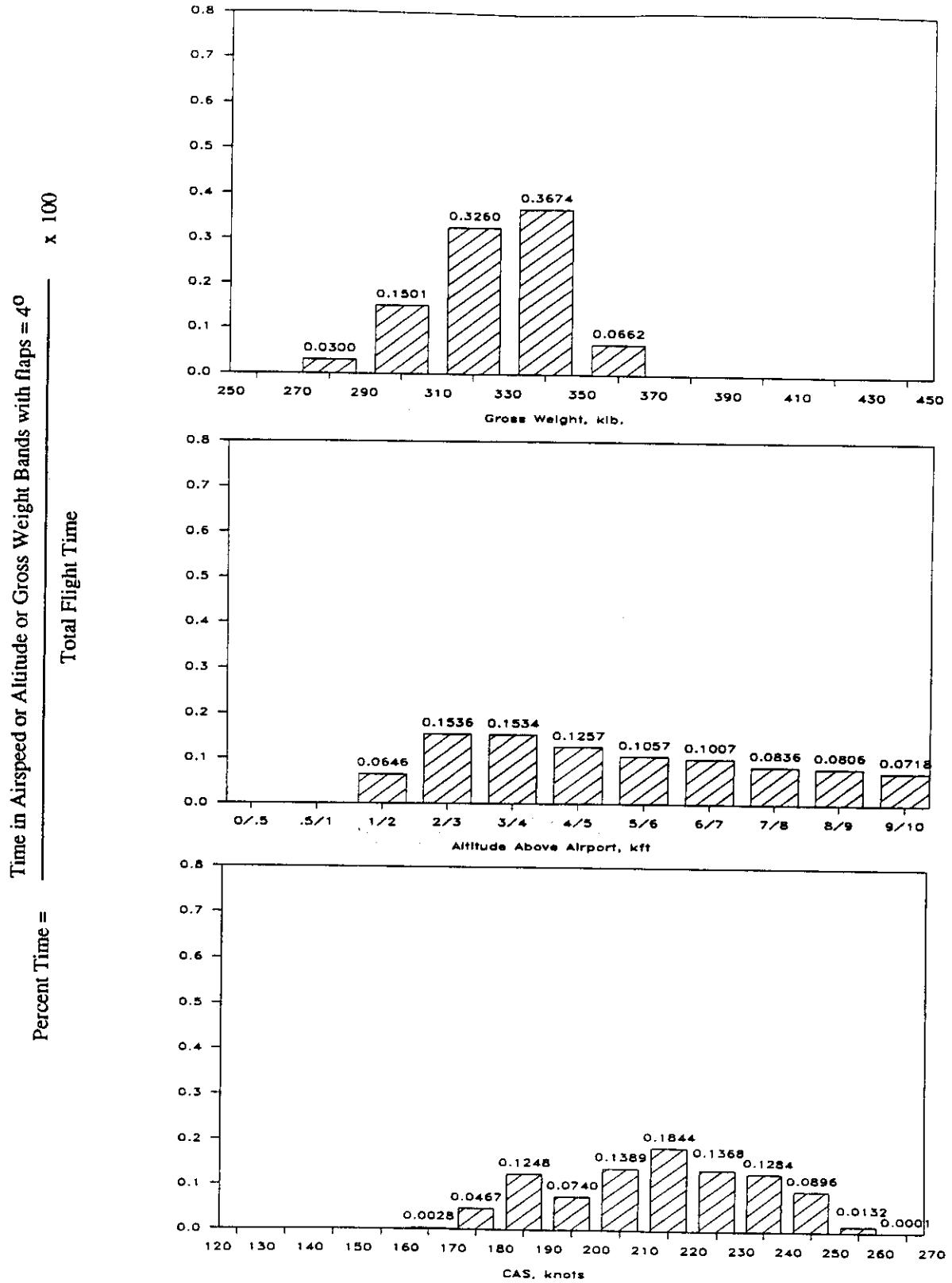
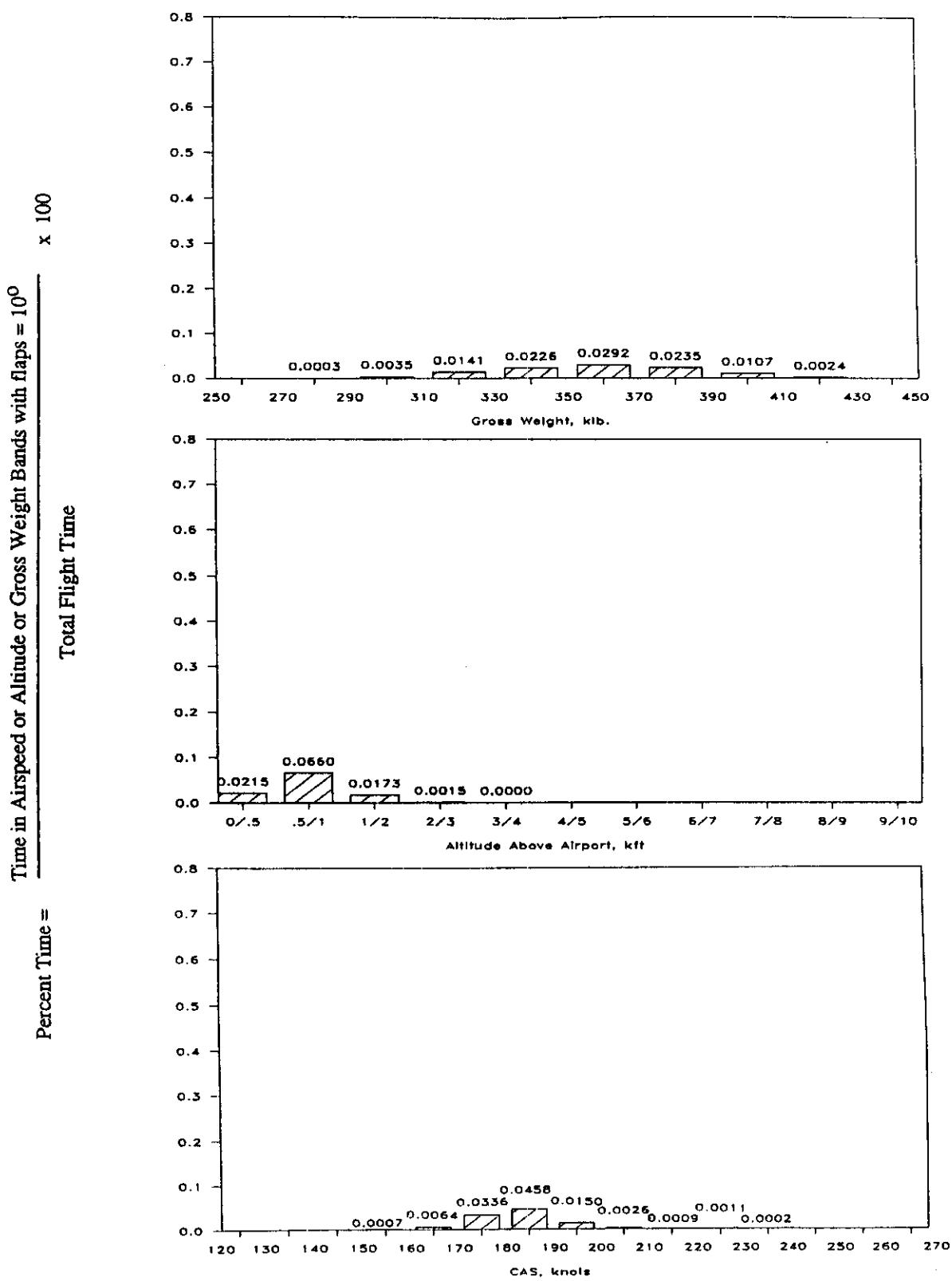


Figure 8.- Percent of total flight time at each flap detent.



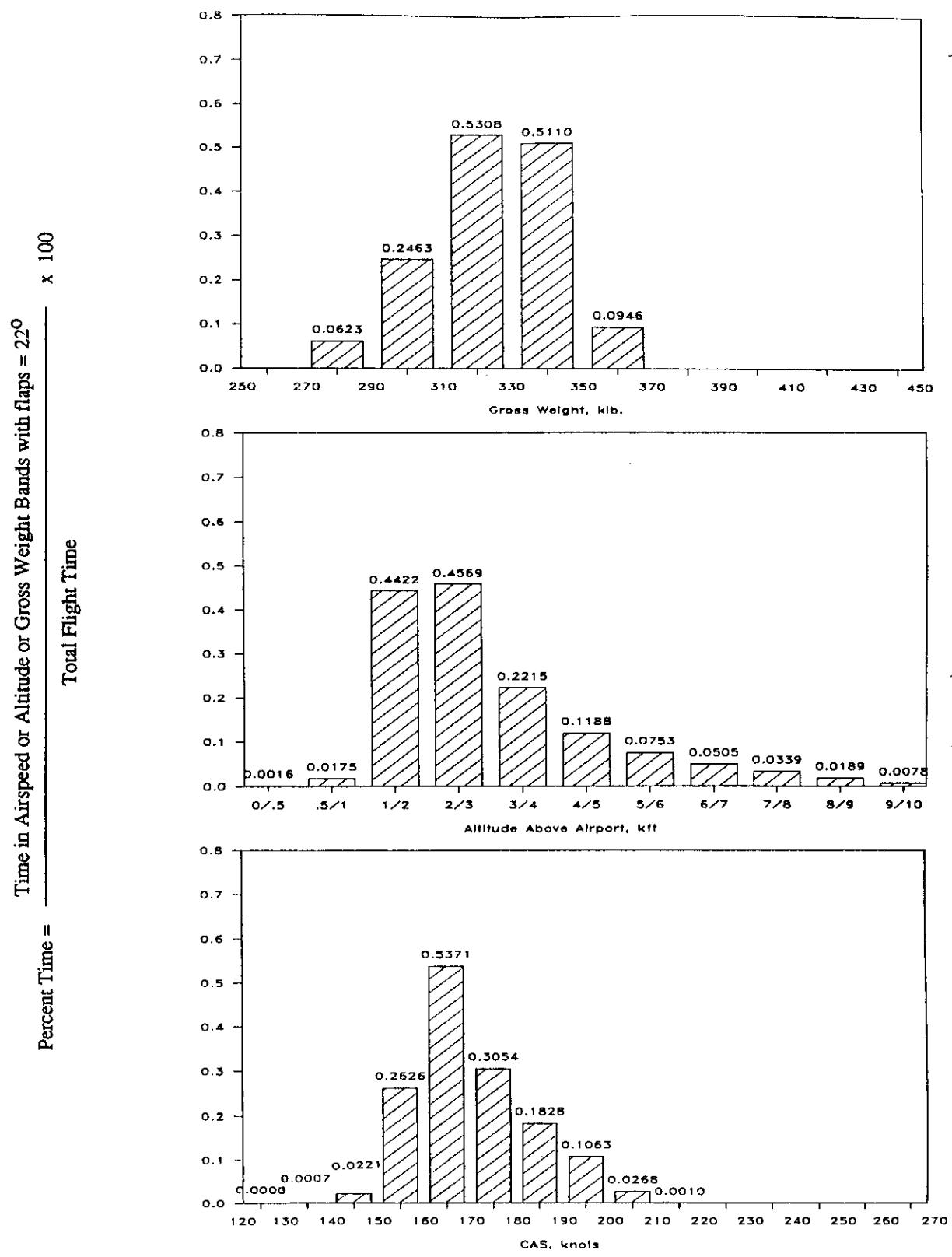
(c) Landing, flaps = 4°; 15.2172 hours

Figure 9. - Continued.



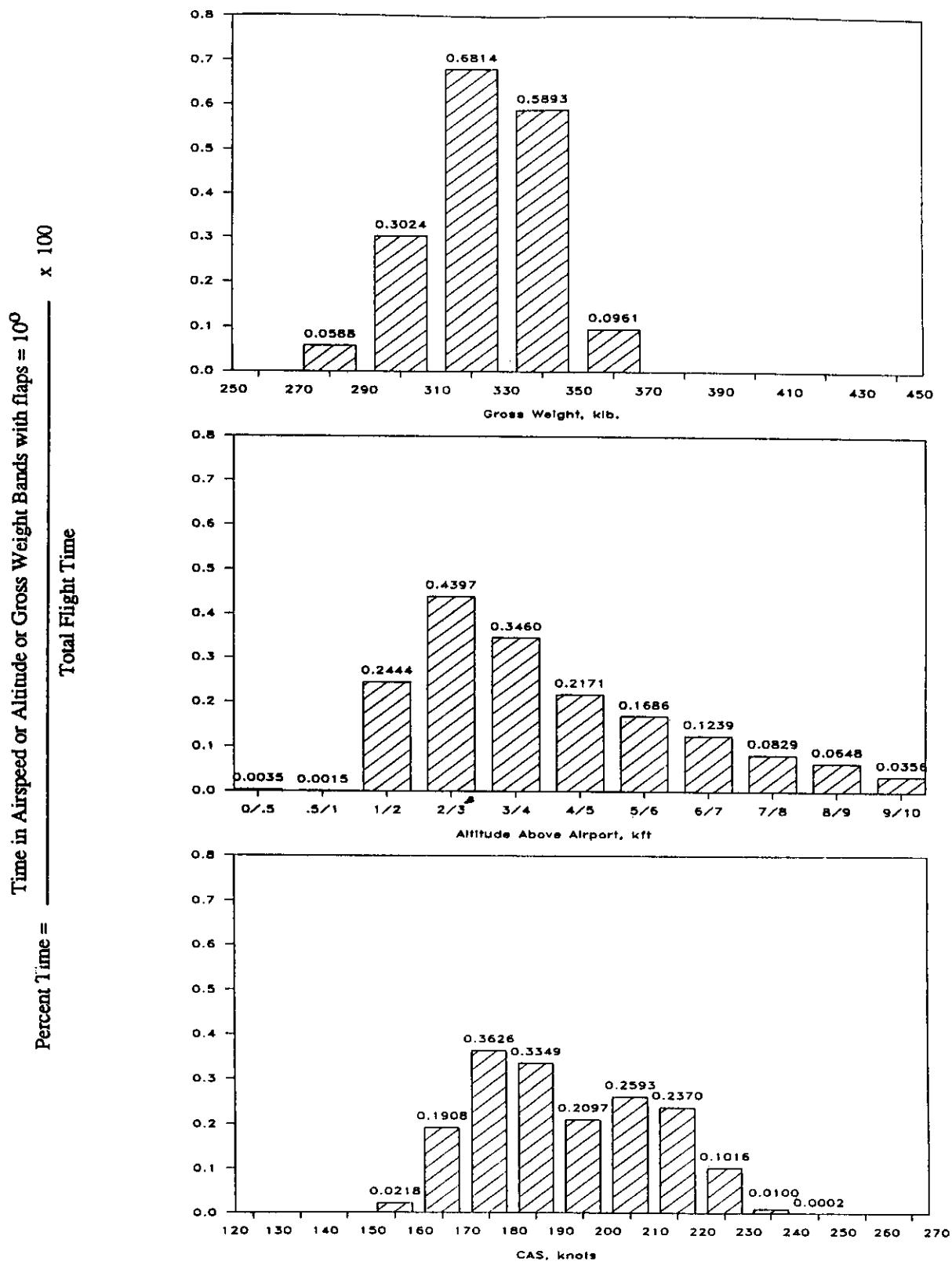
(b) Take off, flaps =  $10^0$ ; 1.7203 hours

Figure 9. - Continued.



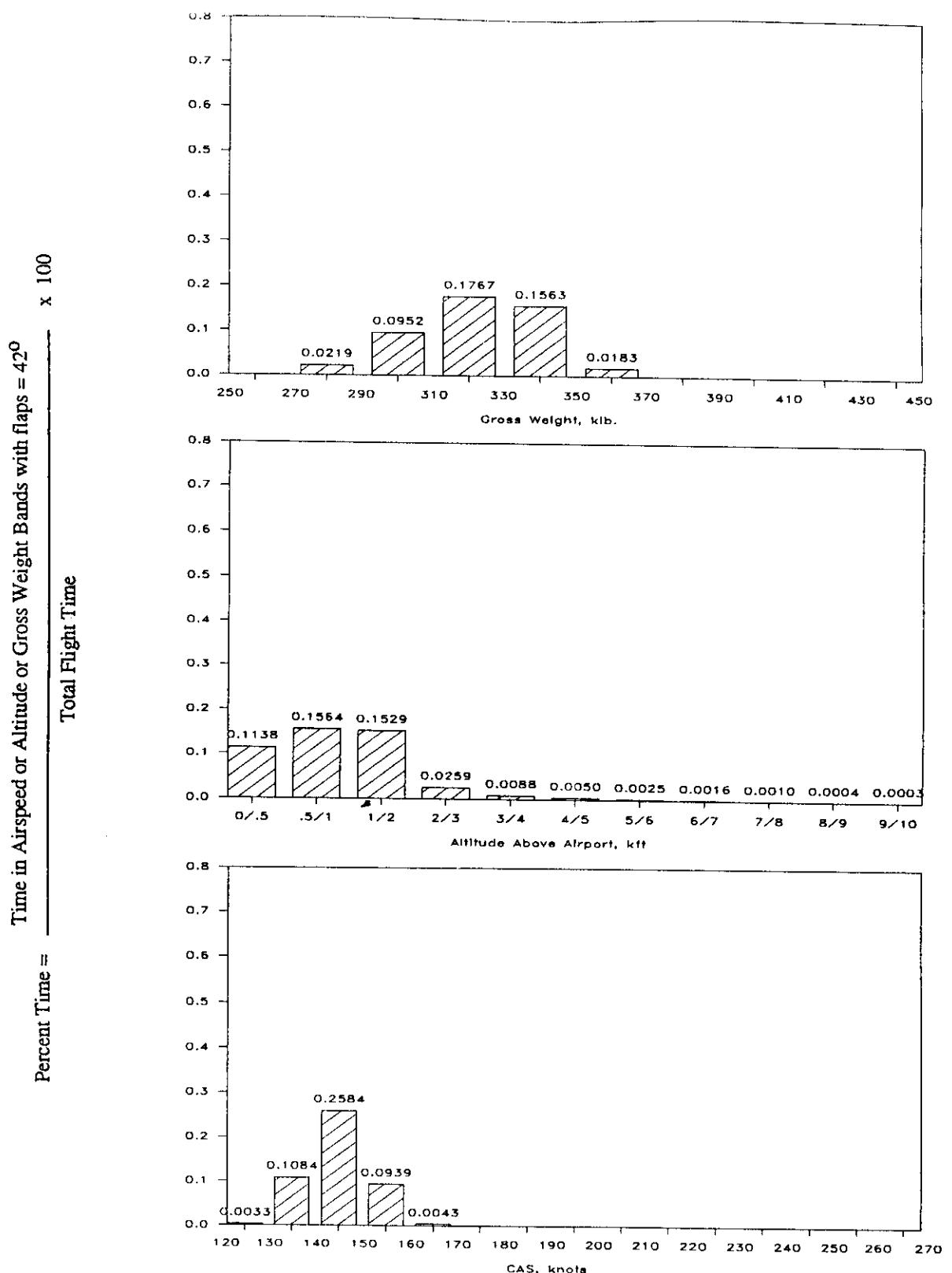
(e) Landing, flaps =  $22^{\circ}$ ; 23.3960 hours

Figure 9. - Continued.



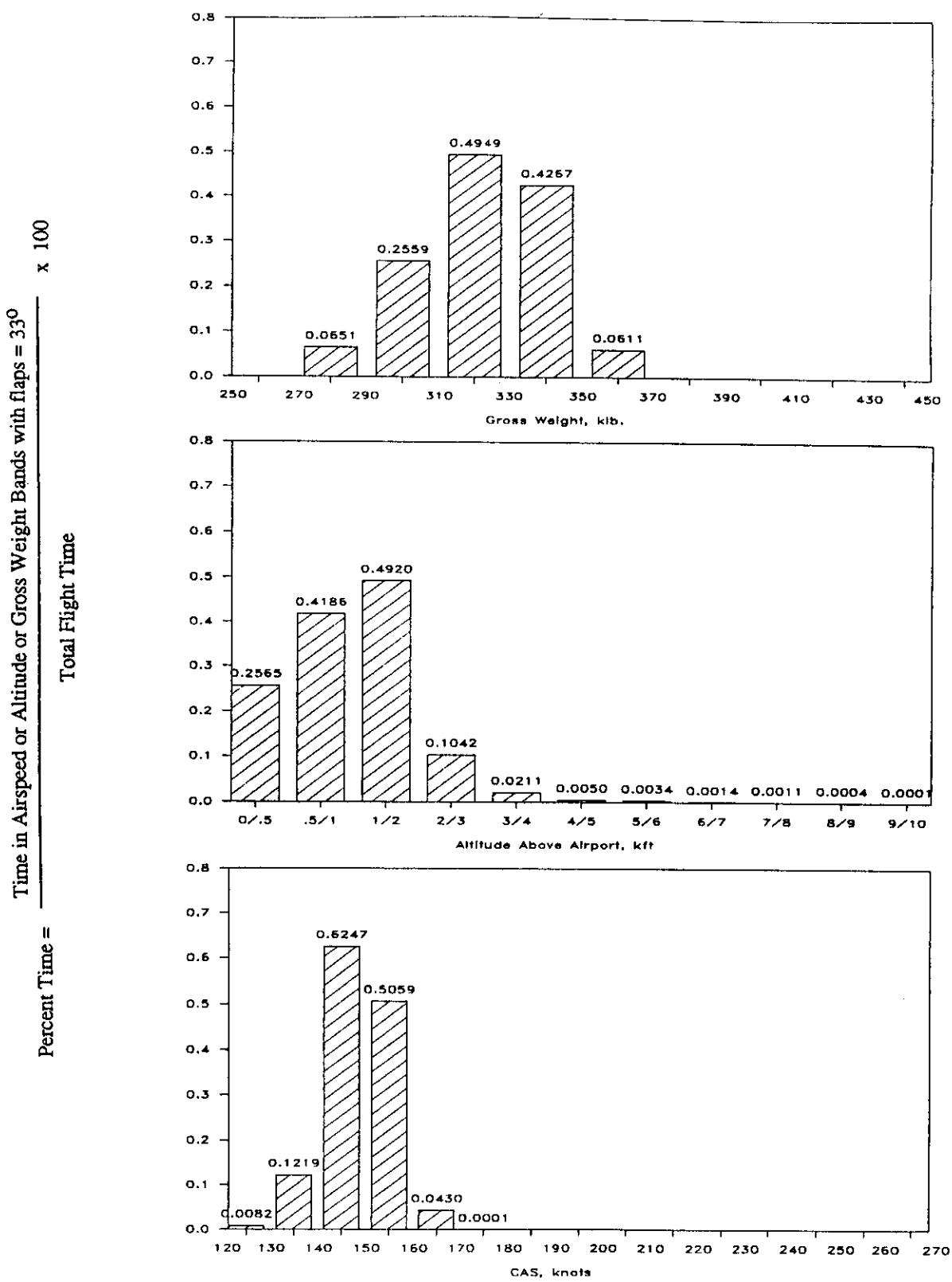
(d) Landing, flaps =  $10^0$ ; 27.9800 hours

Figure 9. - Continued.



(g) Landing, flaps =  $42^{\circ}$ ; 7.5845 hours

Figure 9. - Concluded.



(f) Landing, flaps = 33°; 21.1119 hours

Figure 9. - Continued.

## FLAP DEFLECTIONS, DEGREES

TIME BEFORE TOUCHDOWN MINUTES	2.0	7.0	14.0	20.0	25.0	30.0	37.0
0.0 - .5	.5	0	0	0	0	0	3.9
.5 - 1.0	1.0	0	0	0.8	0.8	10.4	4.7
1.0 - 1.5	1.5	0	0.4	4.0	5.9	23.4	24.7
1.5 - 2.0	2.0	0.7	2.0	11.5	12.3	26.9	9.0
2.0 - 2.5	2.5	2.4	6.3	16.2	17.6	20.5	6.5
2.5 - 3.0	3.0	5.7	8.1	17.3	16.7	7.5	4.8
3.0 - 3.5	3.5	6.8	9.6	9.1	8.4	3.9	2.3
3.5 - 4.0	4.0	6.3	8.0	7.1	6.8	2.5	1.1
4.0 - 4.5	4.5	5.9	8.5	5.7	5.7	2.1	1.5
4.5 - 5.0	5.0	6.9	6.7	6.9	6.3	0.4	0.3
5.0 - 5.5	5.5	6.6	7.5	4.5	4.4	0.4	0.2
5.5 - 6.0	6.0	7.7	8.2	3.6	3.2	0.5	0.1
6.0 - 6.5	6.5	6.8	5.8	2.8	2.7	0.2	0
6.5 - 7.0	7.0	6.8	5.1	3.0	2.6	0	0
7.0 - 7.5	7.5	6.0	4.6	1.3	1.0	0	0
7.5 - 8.0	8.0	5.0	3.3	1.3	1.4	0	0
8.0 - 8.5	8.5	4.8	3.5	1.3	1.2	0	0
8.5 - 9.0	9.0	3.5	2.2	1.0	0.9	0	0
9.0 - 9.5	9.5	3.4	1.5	0.5	0.3	0	0
9.5 - 10.0	10.0	2.1	1.8	0.2	0.3	0	0
10.0 - 11.0	11.0	2.2	1.6	0.5	0.3	0	0
11.0 - 12.0	12.0	2.3	1.3	0.3	0.4	0	0
12.0 - 13.0	13.0	1.9	1.5	0.2	0.1	0	0
13.0 - 14.0	14.0	1.6	0.3	0.2	0.2	0	0.1
14.0 - 15.0	15.0	0.5	0.4	0.1	0.1	0	0
15.0 - 17.0	17.0	0.8	0.7	0.1	0	0	0
17.0 - 19.0	19.0	0.4	0.3	0	0	0	0
19.0 - 21.0	21.0	0	0	0	0.1	0	0
21.0 - 23.0	23.0	0.1	0.1	0	0	0	0
23.0 - 25.0	25.0	0	0	0	0	0	0
25.0 - 30.0	30.0	0.4	0	0	0	0	0
30.0 - 35.0	35.0	0.1	0	0	0	0	0
35.0 - 40.0	40.0	0	0	0	0	0	0
40.0 - 60.0	60.0	0.1	0	0	0	0	0
0.0 - 60.0	97.8	99.6	99.7	99.9	99.5	100.0	33.9

## NOTES:

1. 914 flights
2. The last 15 seconds before touchdown on each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

(b) Landing: Percent of flights vs. time when landing flap deflection is increased to greater than indicated value

Figure 10.- Continued.

## FLAP DEFLECTION, DEGREES

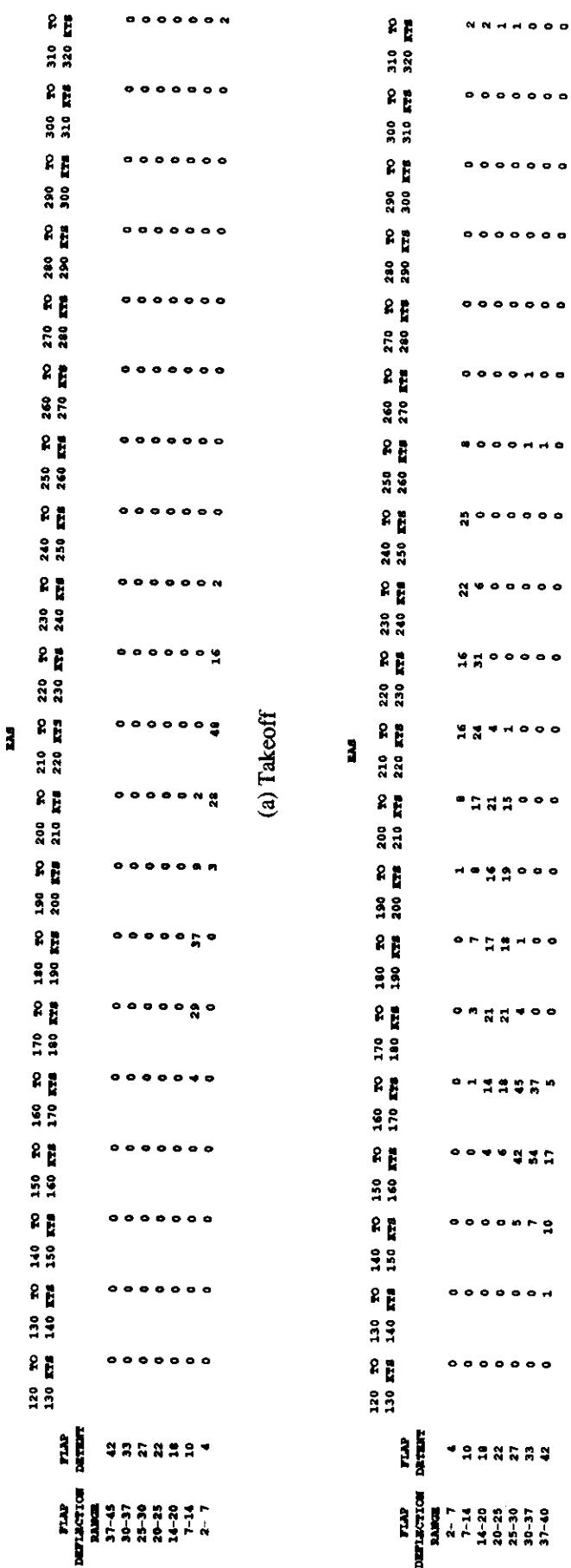
TIME AFTER LIFTOFF MINUTES	30.0	25.0	20.0	14.0	7.0	2.0
0.0 - .1	0	0	0.1	0.2	46.4	0
.1 - .2	0	0	0.1	0	23.1	0
.2 - .3	0	0	0.1	0.1	7.3	1.3
.3 - .4	0	0	0	0.2	2.4	1.3
.4 - .5	0	0	0	0	1.4	6.8
.5 - .6	0	0	0	0	0.9	7.9
.6 - .8	0	0	0	0	1.0	26.5
.8 - 1.0	0	0	0	0	0.2	22.5
1.0 - 1.2	0	0	0	0	0	14.2
1.2 - 1.4	0	0	0	0	0	7.9
1.4 - 1.6	0	0	0	0.1	0.1	6.0
1.6 - 1.8	0	0	0	0	0	2.4
1.8 - 2.0	0	0	0	0	0	2.0
2.0 - 2.2	0	0	0	0	0	0.2
2.2 - 2.4	0	0	0	0	0	0.3
2.4 - 2.6	0	0	0	0	0	0.3
2.6 - 2.8	0	0	0	0	0	0.1
2.8 - 3.0	0	0	0	0	0	0
3.0 - 3.5	0	0	0	0	0	0
3.5 - 4.0	0	0	0	0	0	0
4.0 - 4.5	0	0	0	0	0	0
4.5 - 5.0	0	0	0	0	0	0
5.0 - 6.0	0	0	0	0	0	0
6.0 - 7.0	0	0	0	0	0	0
7.0 - 8.0	0	0	0	0	0	0
8.0 - 9.0	0	0	0	0	0	0
9.0 - 10.0	0	0	0	0	0	0
10.0 - 15.0	0	0	0	0	0	0
15.0 - 20.0	0	0	0	0	0	0
20.0 - 25.0	0	0	0	0	0	0
0.0 - 25.0	0	0	0.3	0.5	82.8	99.9

## Notes:

1. 914 flights
2. The first 15 seconds after liftoff for each flight are not included.
3. Flap deflections less than 2 degrees were considered to be zero.

- (a) Takeoff: Percent of flights vs times when takeoff flap deflection is reduced to less than indicated values

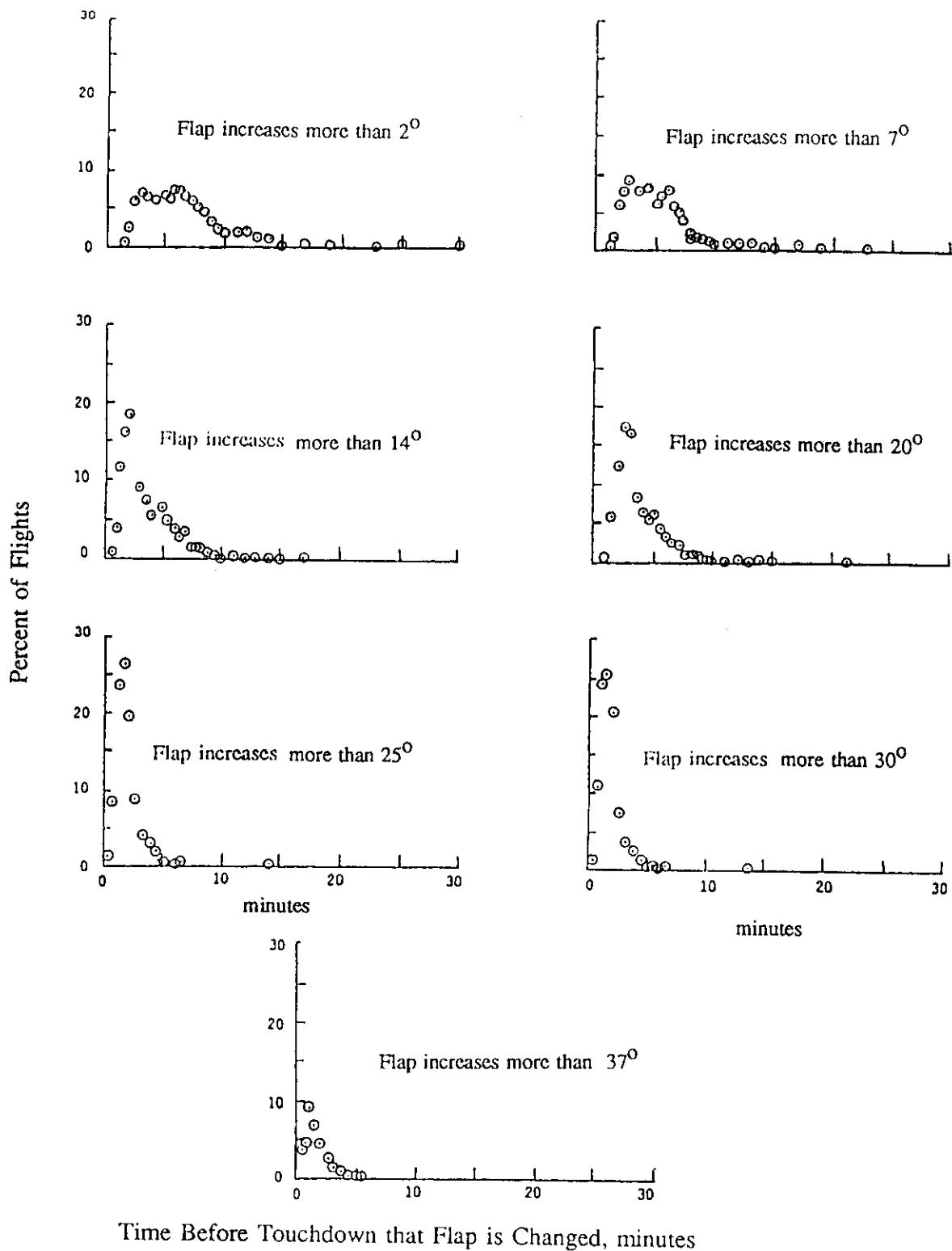
Figure 10.- Flap deflection times.



(a) Takeoff

(b) Landing

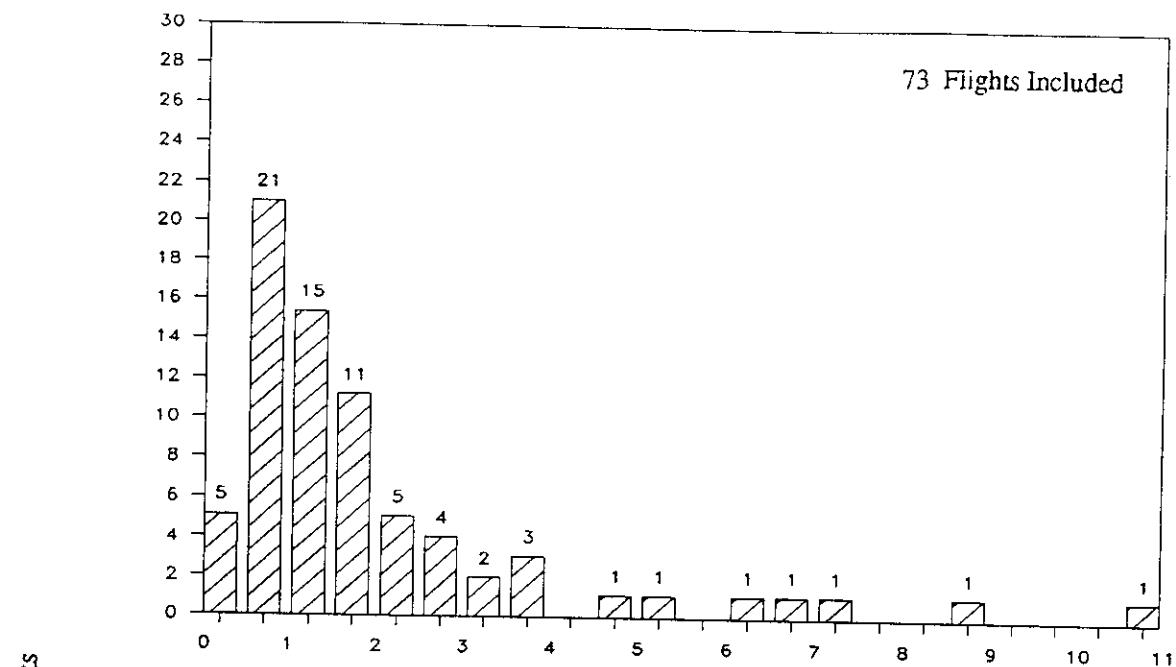
Figure 11.- Percent of flights vs. equivalent airspeed at flap detent change.



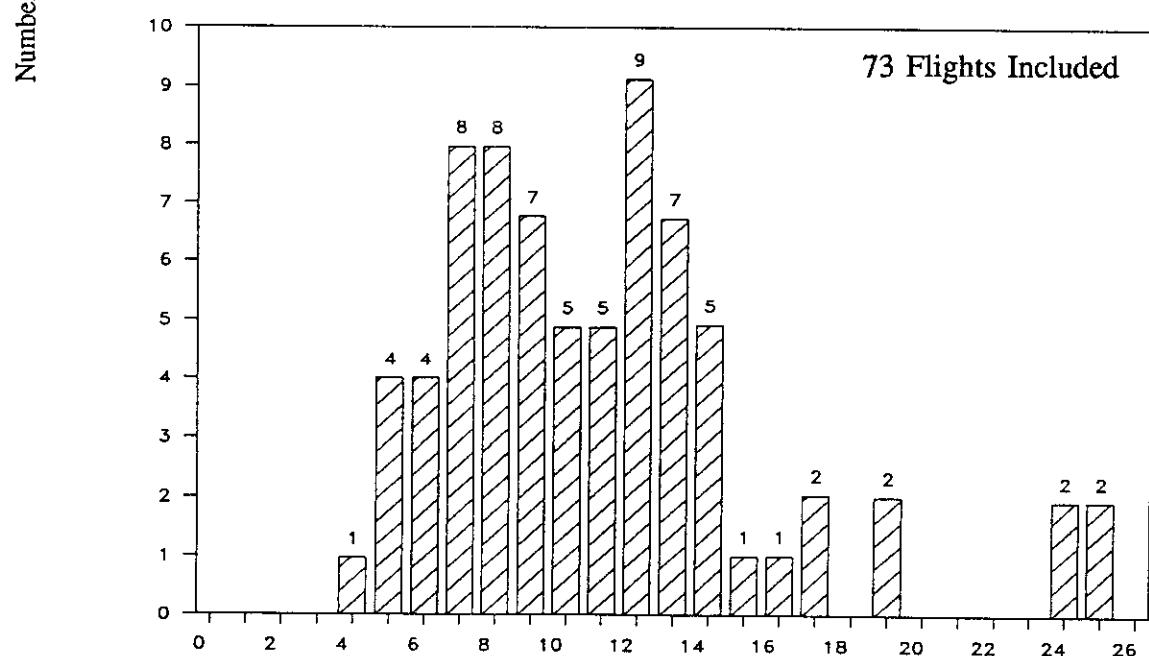
Time Before Touchdown that Flap is Changed, minutes

(c) Landing: Plots of data from Figure 10(b)

Figure 10. - Concluded.



(c) Minutes above 10,000 ft. that flaps deflected  $> 2$  deg



(d) Minutes before touchdown of initial flap deflection

Figure 12.- Concluded.

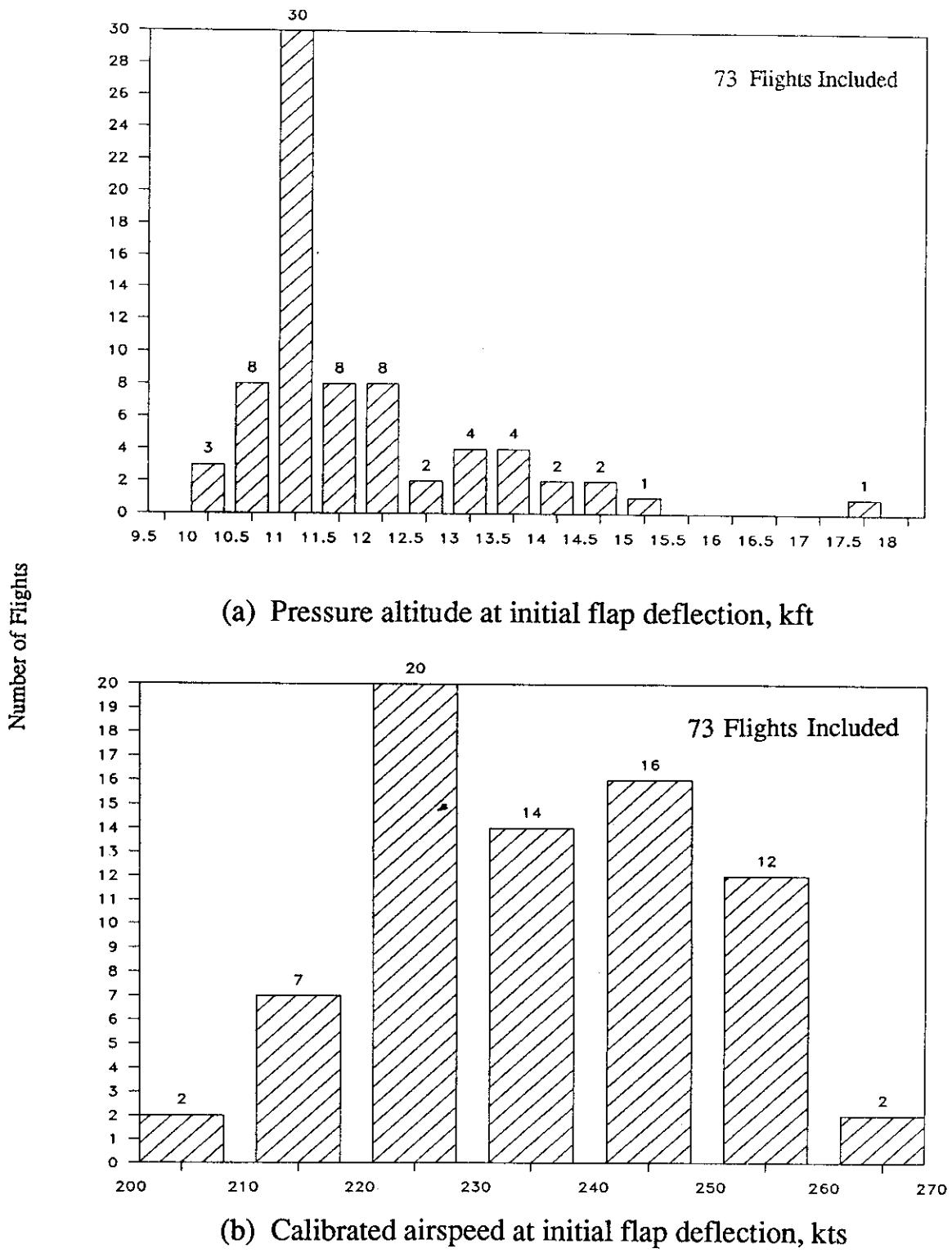


Figure 12.- Flap use above 10,000 feet pressure altitude.

## PRESSURE ALTITUDE BANDS

$a_{LM}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
<b>LEVEL g's</b>										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.30	0.04	0.06	0.03	0.03	0.01	0	0	0	0	0
.20	1.03	0.69	0.23	0.21	0.06	0.05	0.02	0	0	0.01
.15	4.32	3.22	1.22	0.69	0.38	0.18	0.07	0.02	0	0.16
.10	17.18	15.48	7.49	3.25	1.73	0.92	0.26	0.12	0	0.70
.05	47.74	42.94	32.77	20.53	13.24	8.47	3.71	2.15	0	3.21
0.00	153.48	129.03	122.85	119.14	120.15	139.09	165.95	184.68	181.22	161.87
-.05	30.05	26.10	22.35	17.65	11.72	7.01	3.23	2.02	3.17	8.84
-.10	4.15	3.94	3.09	1.98	1.02	0.39	0.21	0.10	0.32	1.03
-.15	0.39	0.43	0.29	0.26	0.12	0.05	0.05	0.01	0	0.11
-.20	0.03	0.06	0.03	0.03	0.01	0.01	0.01	0	0	0.01
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS									1619.24	
TOTAL FLIGHT MILES									708383.60	
FLAPS UP AND DOWN									1619.24	
FLAPS UP AND DOWN									708383.60	

(b)  $a_{LM}$  level crossing counts per hour within pressure altitude bands

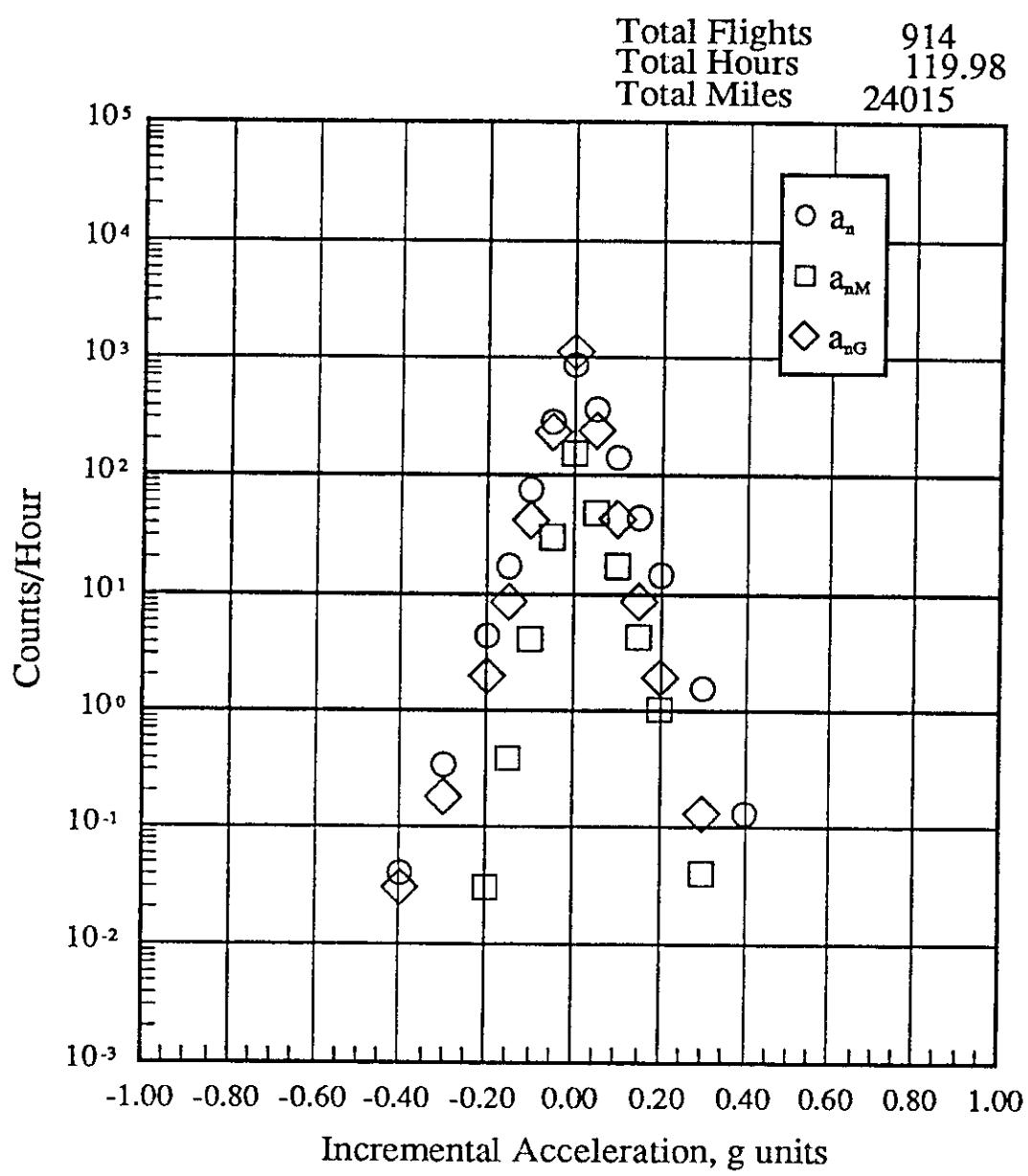
Figure 13.- Continued.

PRESSURE ALTITUDE BANDS

LEVEL g's	PRESSURE ALTITUDE BANDS									
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0.01	0.01	0.01	0	0	0	0	0	0
.70	0	0.03	0.01	0	0	0	0	0	0	0
.60	0	0.06	0.03	0.01	0	0	0	0	0	0
.50	0	0.12	0.10	0.04	0	0	0	0.02	0	0.01
.40	0.13	0.36	0.28	0.17	0.01	0.01	0.04	0.01	0	0.02
.30	1.57	1.37	0.97	0.65	0.24	0.24	0.09	0.10	0.03	0.07
.20	14.58	9.31	5.89	3.41	1.21	0.80	0.58	0.39	0	0.35
.15	43.58	25.84	15.83	9.58	3.83	2.54	1.82	1.26	0	2.64
.10	140.52	101.17	64.10	35.52	17.95	13.09	8.71	6.70	4.76	7.71
.05	362.38	208.06	194.39	148.89	115.24	92.28	67.81	53.17	70.77	29.44
0.00	865.02	811.63	947.45	1041.56	1123.34	1301.39	1533.91	1677.95	1741.76	108.65
-.05	283.09	148.22	135.16	122.23	90.73	71.59	57.67	48.77	93.94	1403.05
-.10	74.69	39.01	34.15	23.99	13.69	9.82	7.81	6.05	10.47	87.25
-.15	17.14	9.77	8.40	6.26	3.11	1.73	1.61	1.20	0.95	3.87
-.20	4.42	3.36	3.31	2.31	1.06	0.55	0.49	0.35	0.32	1.22
-.30	0.34	0.64	0.55	0.36	0.13	0.02	0.08	0.04	0	0.16
-.40	0.04	0.17	0.14	0.14	0.02	0	0.02	0.01	0	0.04
-.50	0	0.06	0.04	0.06	0	0	0.01	0	0	0.01
-.60	0	0.03	0	0.01	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-.100	0	0	0	0	0	0	0	0	0	0
-.120	0	0	0	0	0	0	0	0	0	0
-.140	0	0	0	0	0	0	0	0	0	0
-.160	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	1119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708383.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS										1619.24
TOTAL FLIGHT MILES										708383.60
FLAPS UP AND DOWN										
FLAPS DOWN AND UP										

(a)  $a_n$  level crossing counts per hour within pressure altitude bands

Figure 13.- Normal acceleration exceedances.



(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

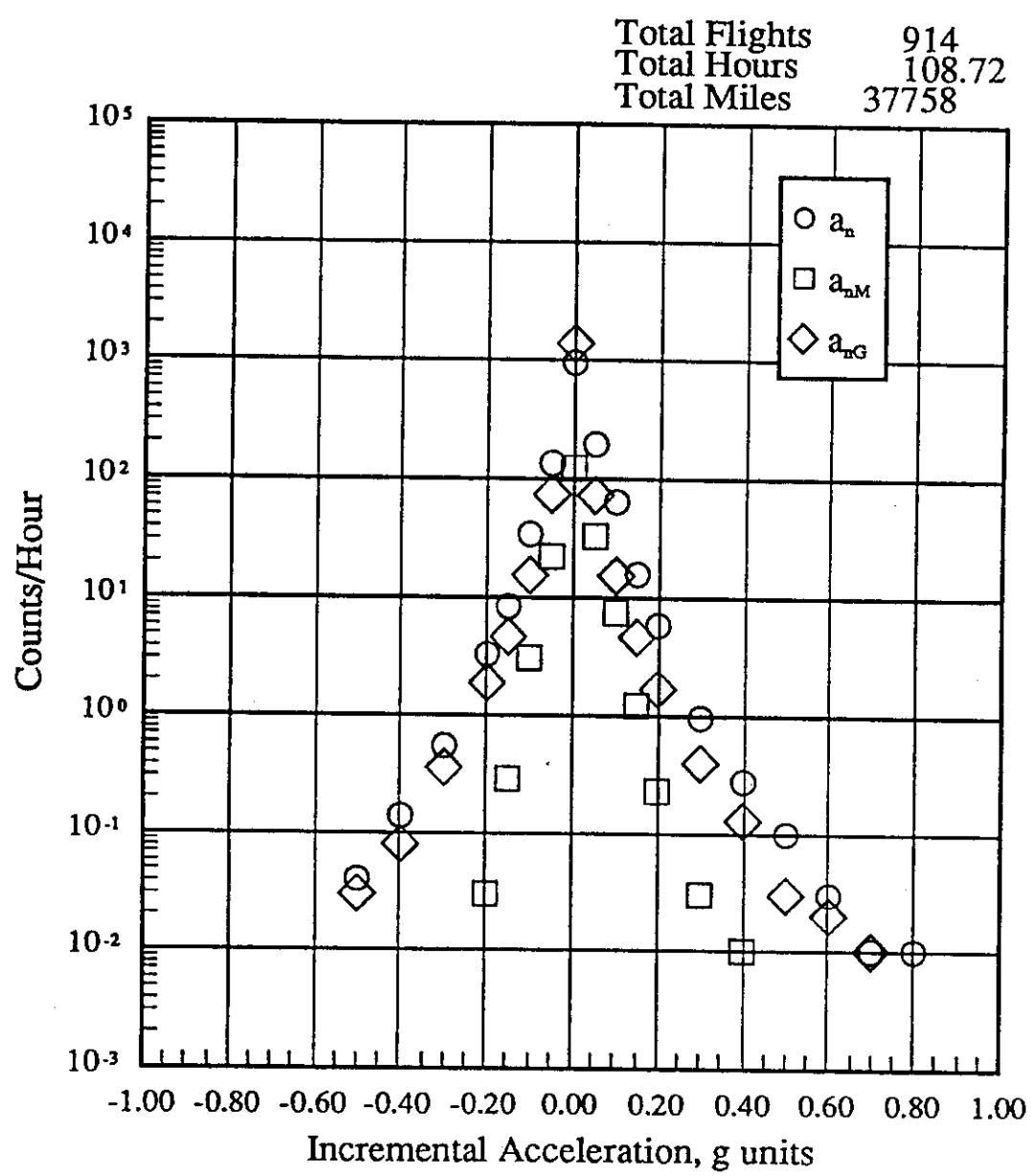
Figure 13.- Continued.

PRESSURE ALTITUDE BANDS

$a_{nG}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL $g's$										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0.01	0	0	0	0	0	0
.60	0	0.02	0	0.02	0	0	0	0	0	0
.50	0	0.06	0.03	0.03	0	0	0	0	0	0.01
.40	0	0.14	0.13	0.04	0.01	0	0.01	0	0	0.02
.30	0.13	0.35	0.40	0.26	0.02	0.01	0.06	0.01	0	0.09
.20	1.94	1.80	1.70	1.10	0.24	0.14	0.20	0.11	0	0.54
.15	8.73	5.00	4.67	2.84	0.95	0.59	0.72	0.51	0	1.87
.10	42.48	17.92	15.35	9.56	4.31	3.29	3.37	2.73	0.95	8.07
.05	239.27	92.41	72.85	50.69	31.24	27.47	27.95	23.90	32.37	50.21
0	1121.52	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1702.41	1552.74
-.05	232.50	94.22	73.75	51.73	32.35	27.29	27.53	23.69	31.74	49.83
-.10	41.39	17.75	15.44	9.25	4.57	3.31	3.26	2.62	1.27	7.91
-.15	8.64	4.98	4.68	2.73	0.92	0.67	0.68	0.45	0	1.82
-.20	1.99	2.02	1.89	1.10	0.18	0.19	0.20	0.10	0	0.56
-.30	0.18	0.45	0.36	0.19	0.02	0	0.03	0.01	0	0.09
-.40	0.03	0.14	0.08	0.06	0	0	0.01	0	0	0.02
-.50	0	0.06	0.03	0.01	0	0	0.01	0	0	0.01
-.60	0	0.01	0	0.01	0	0	0.01	0	0	0
-.70	0	0.01	0	0	0	0	0.01	0	0	0
-.80	0	0.01	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0
-1.00	0	0	0	0	0	0	0	0	0	0
-1.20	0	0	0	0	0	0	0	0	0	0
-1.40	0	0	0	0	0	0	0	0	0	0
-1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	70883.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									1619.24	
TOTAL FLIGHT MILES FLAPS UP AND DOWN									70883.60	

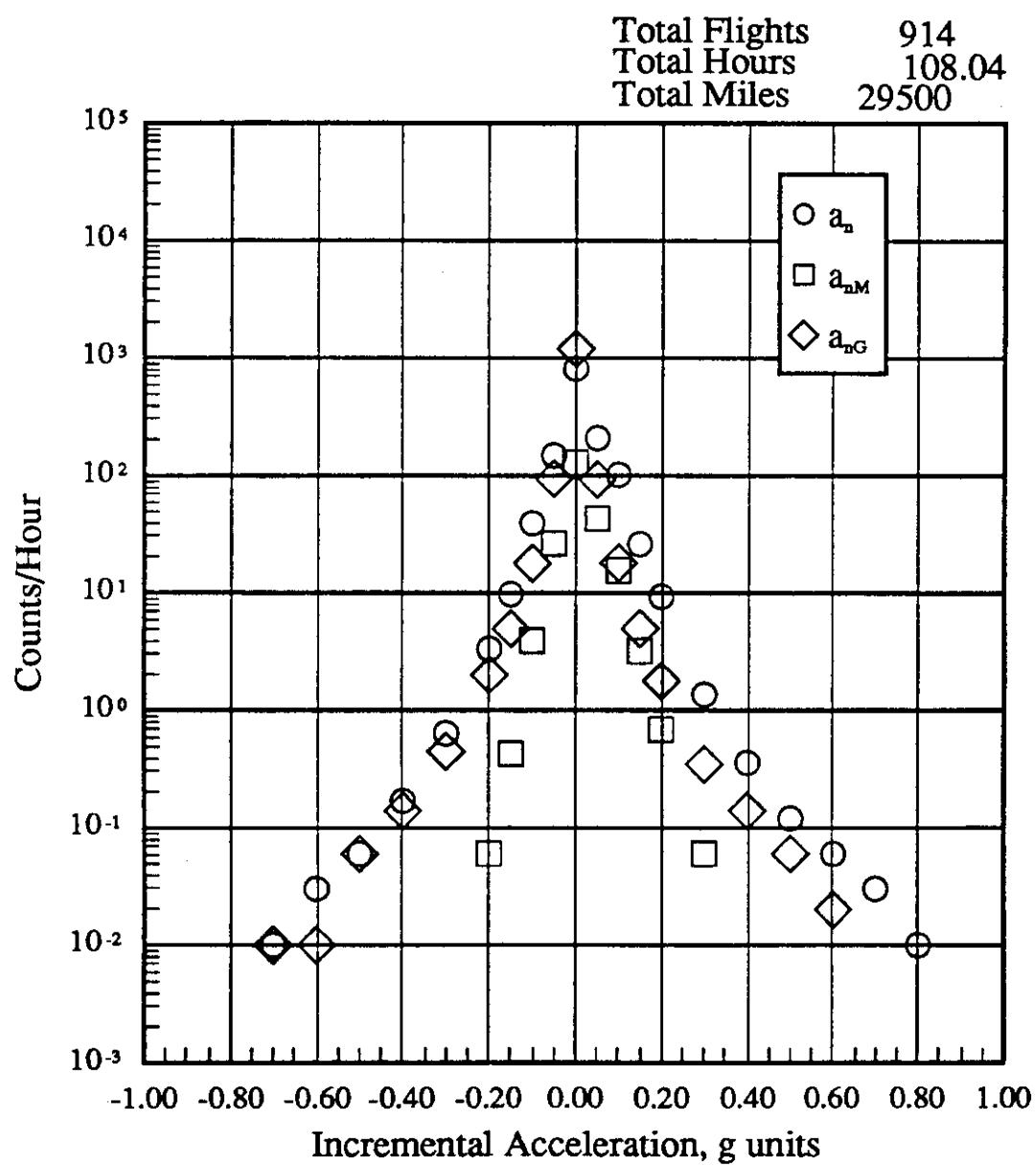
(c)  $a_{nG}$  level crossing counts per hour within pressure altitude bands

Figure 13.- Continued.



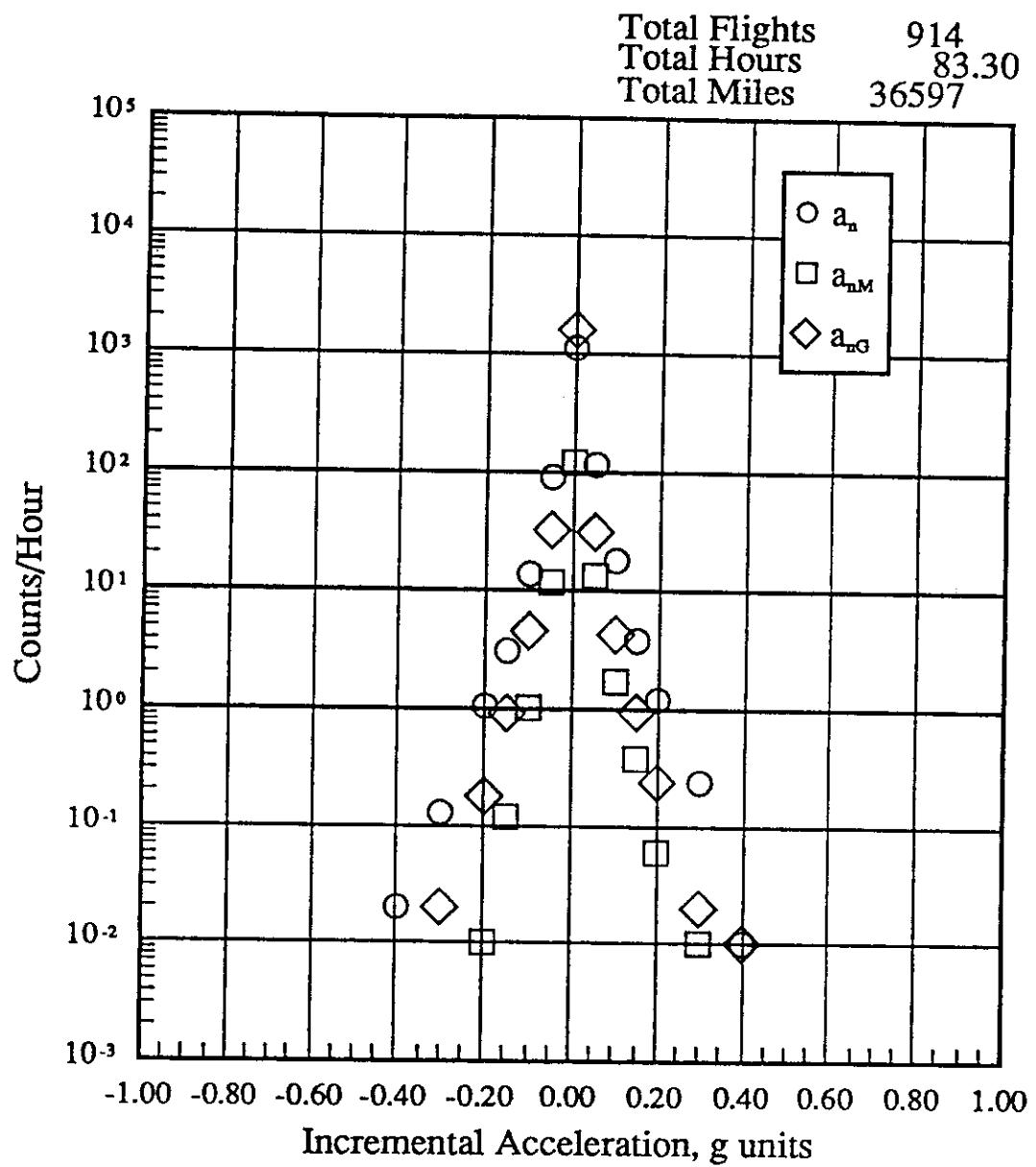
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 13.- Continued.



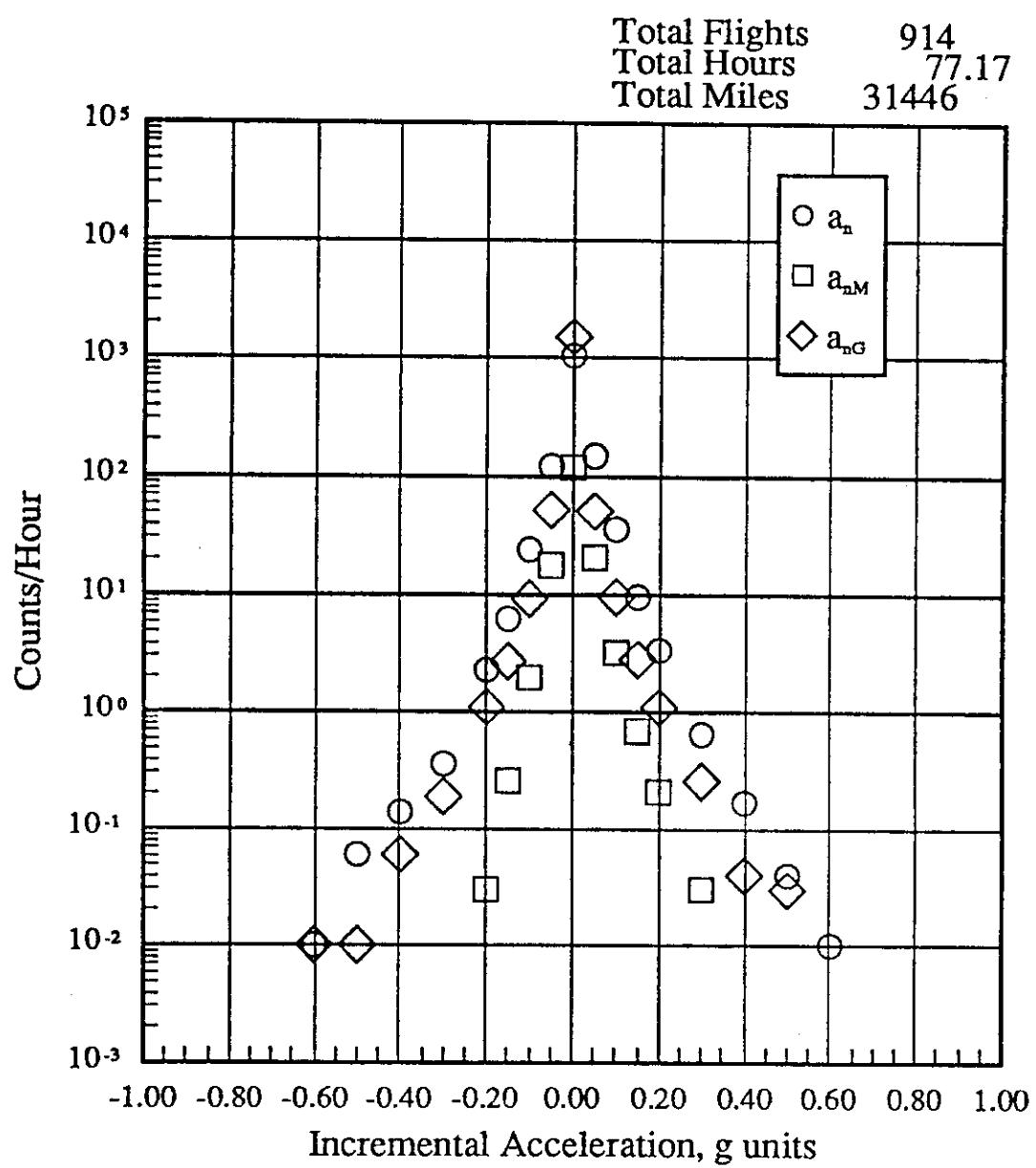
(e)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 4500 to 9500 feet altitude

Figure 13.- Continued.



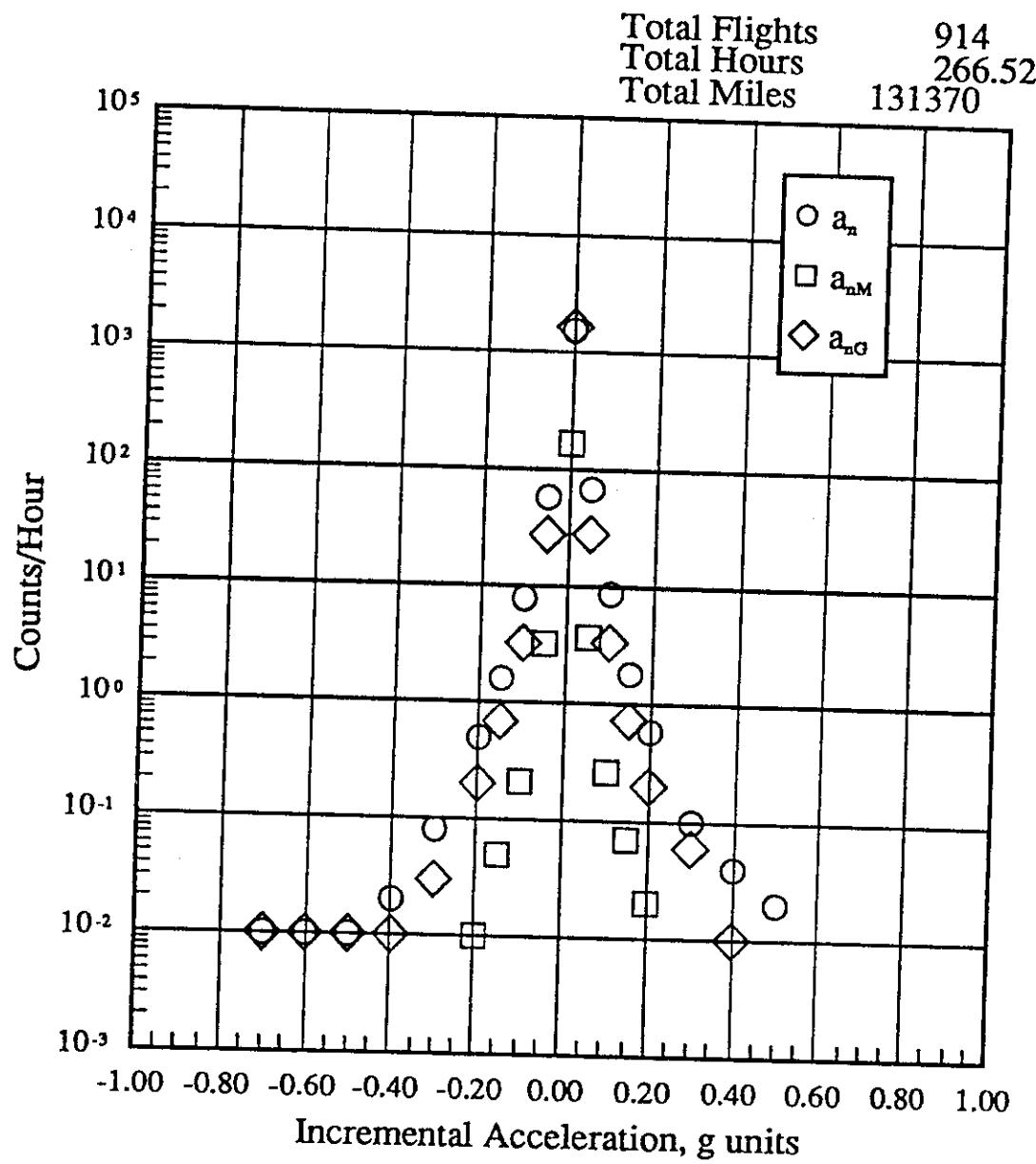
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 13.- Continued.



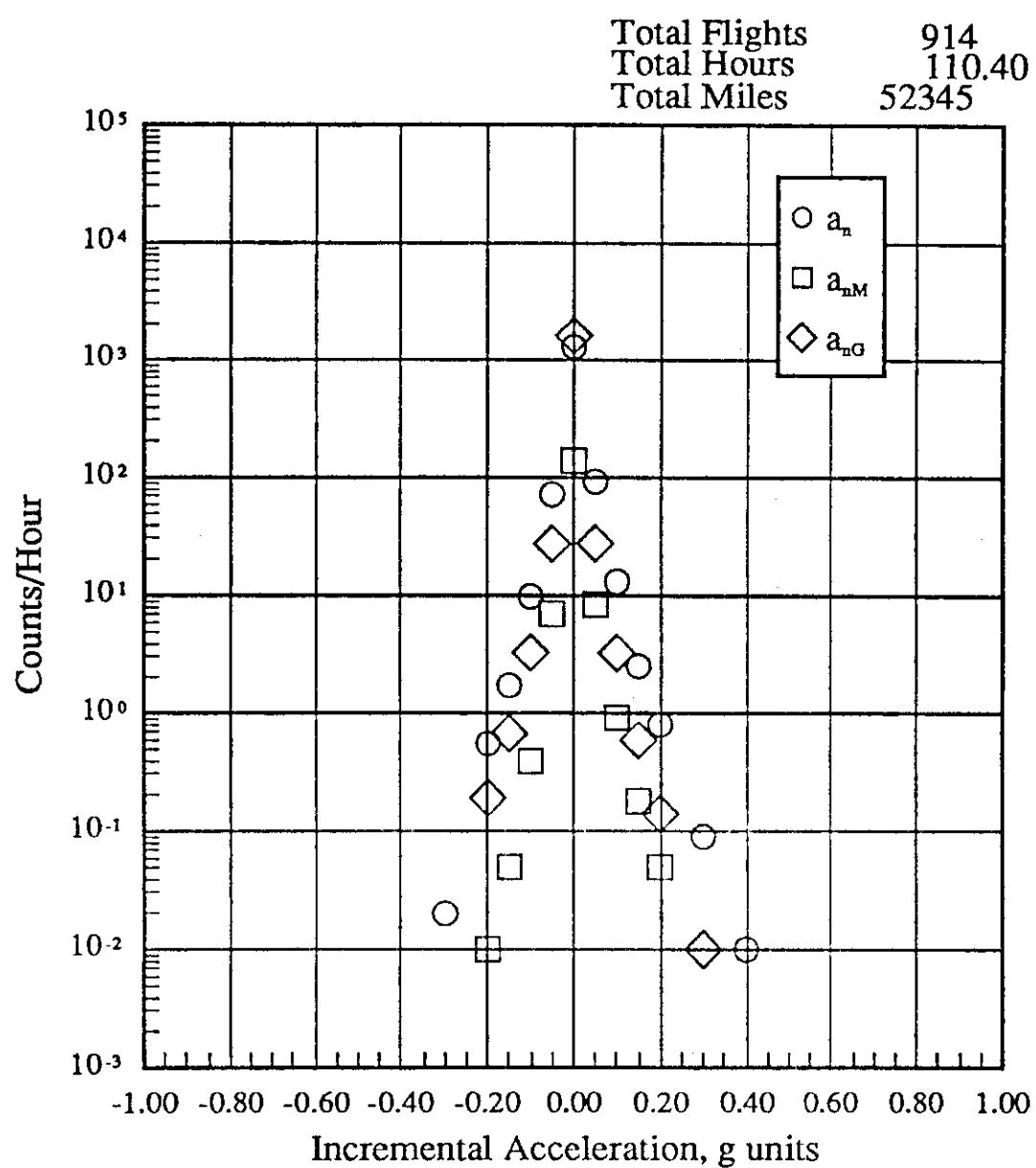
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 13.- Continued.



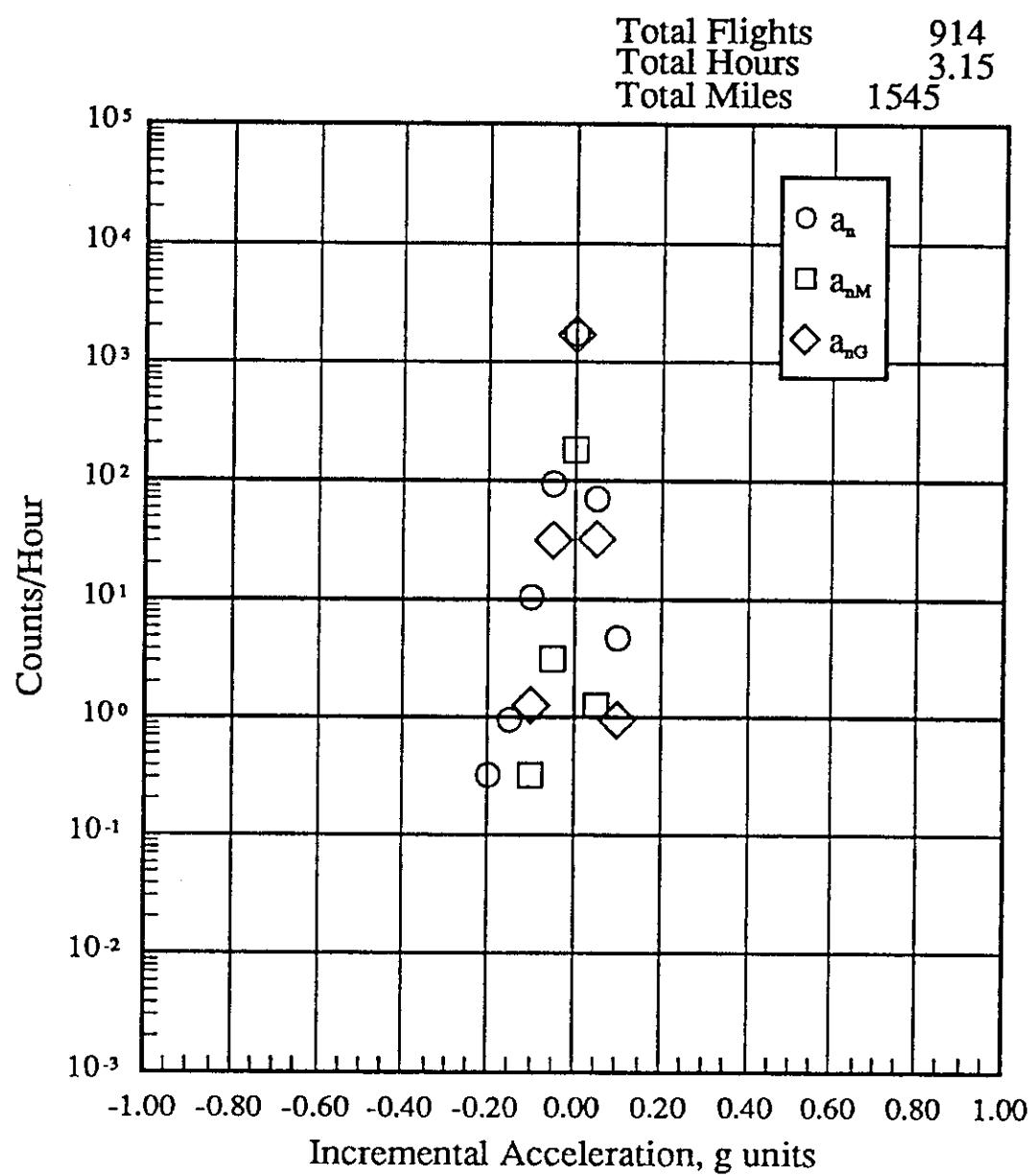
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 13.- Continued.



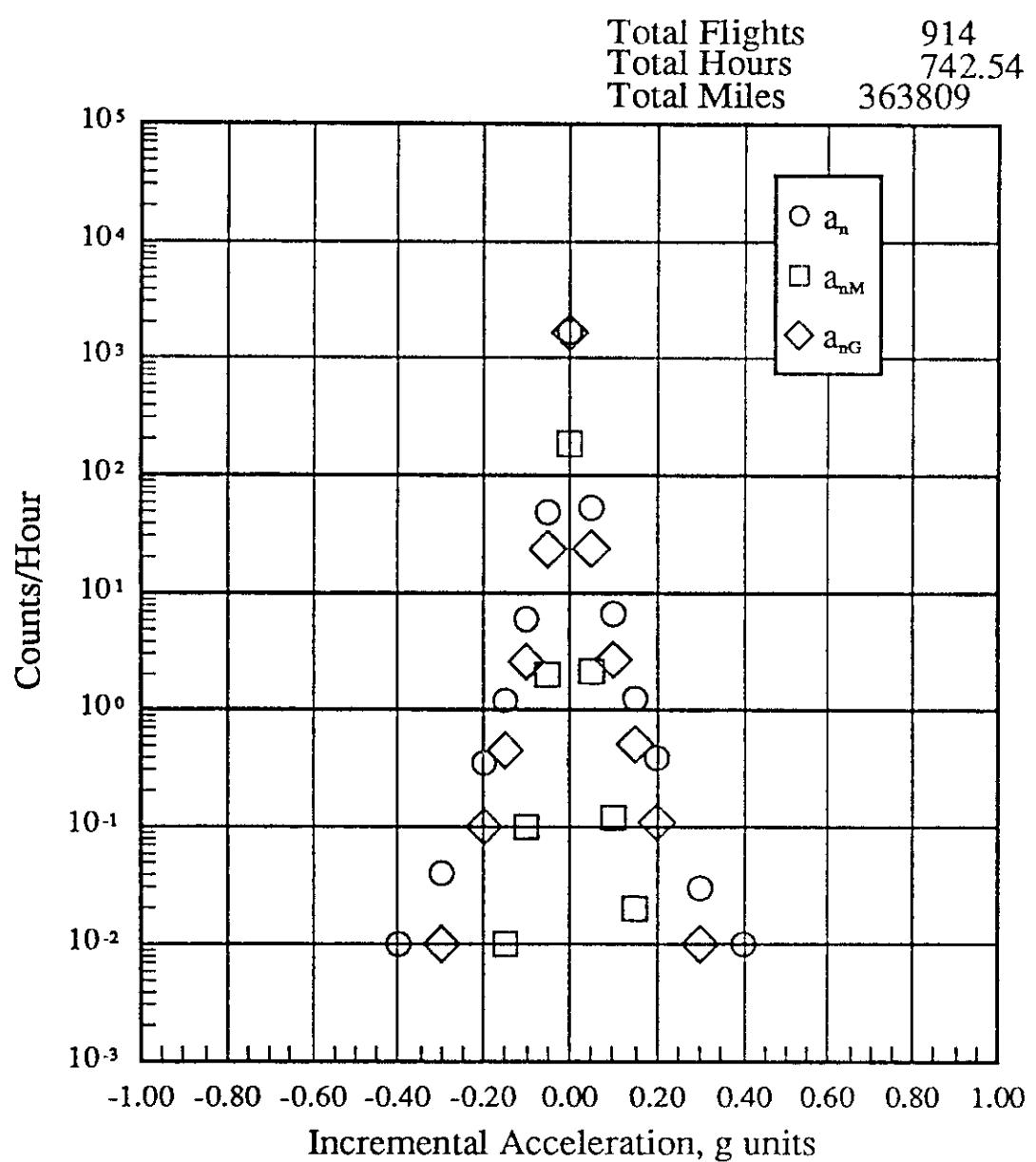
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 13.- Continued.



(l)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 13.- Continued.



(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

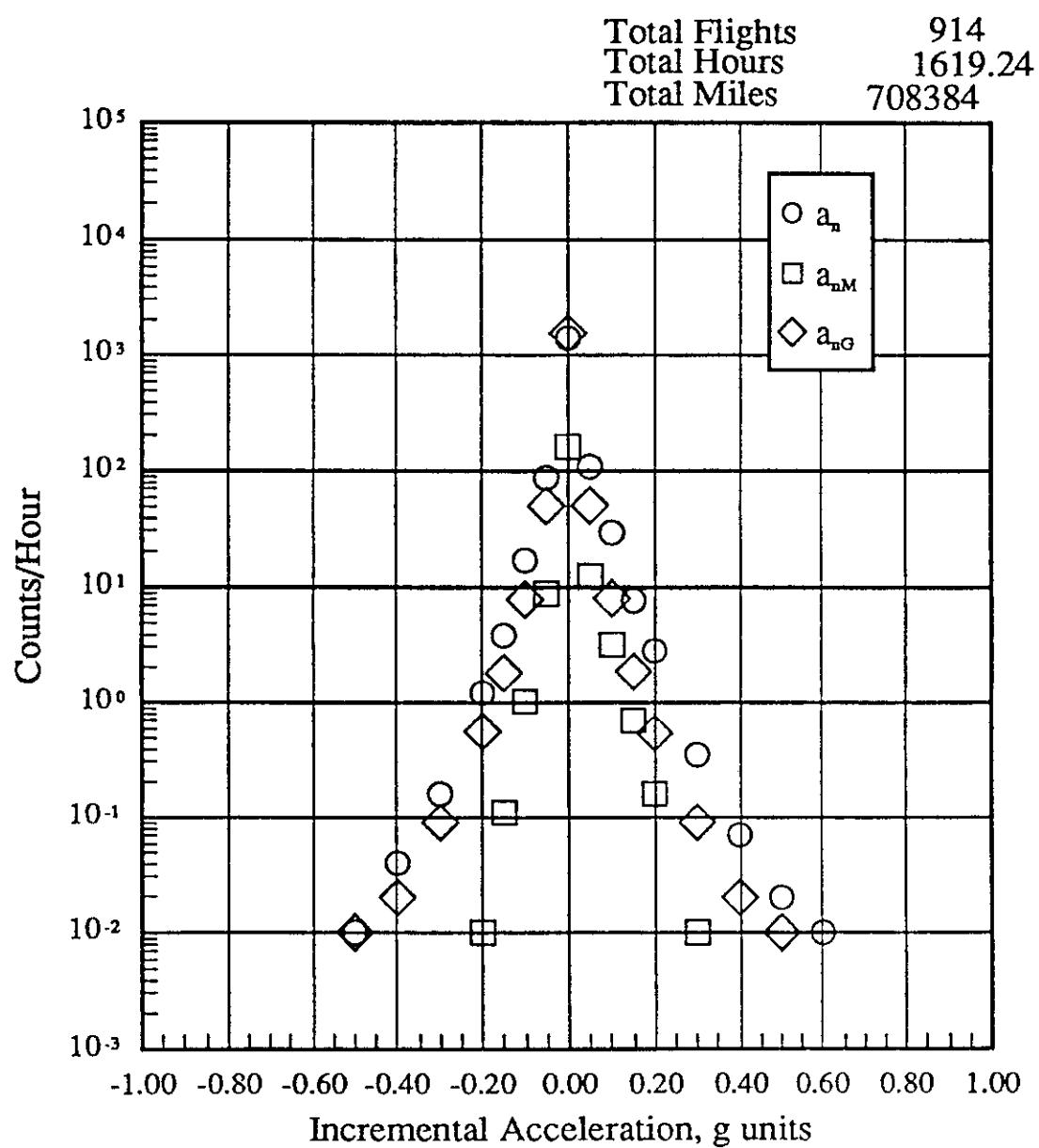
Figure 13.- Continued.

PRESSURE ALTITUDE BANDS

$a_y$ g's	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.48	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0
-.16	0	0	0	0	0	0	0	0	0	0
.12	0.01	0.04	0.01	0.01	0.02	0.01	0	0	0	0.01
-.08	0.59	0.43	0.43	0.27	0.08	0.11	0.08	0.04	0.32	0.16
-.06	3.47	1.89	1.78	0.83	0.44	0.37	0.27	0.22	0.32	0.74
-.04	28.28	12.22	10.33	6.10	3.27	2.79	2.01	1.70	3.49	5.36
-.02	178.39	84.20	74.01	58.79	40.25	29.99	20.82	18.29	45.07	42.56
0	859.73	718.92	727.68	768.95	787.00	969.87	1323.92	1497.85	1679.24	1211.54
-.02	430.65	172.22	120.92	81.14	47.85	33.95	25.77	19.75	32.69	73.36
-.04	56.94	19.50	11.39	6.97	2.59	2.12	1.86	1.39	2.22	7.82
-.06	6.73	2.76	1.94	1.21	0.40	0.26	0.22	0.21	0	1.04
-.08	0.86	0.63	0.50	0.29	0.16	0.05	0.04	0.04	0	0.19
-.12	0.06	0.12	0.06	0.04	0	0	0	0	0	0.02
-.16	0	0.04	0	0.01	0	0	0	0	0	0
-.20	0	0.01	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	708333.60
TOTAL FLIGHTS									914	
TOTAL FLIGHT HOURS										1619.24
TOTAL FLIGHT MILES										708333.60

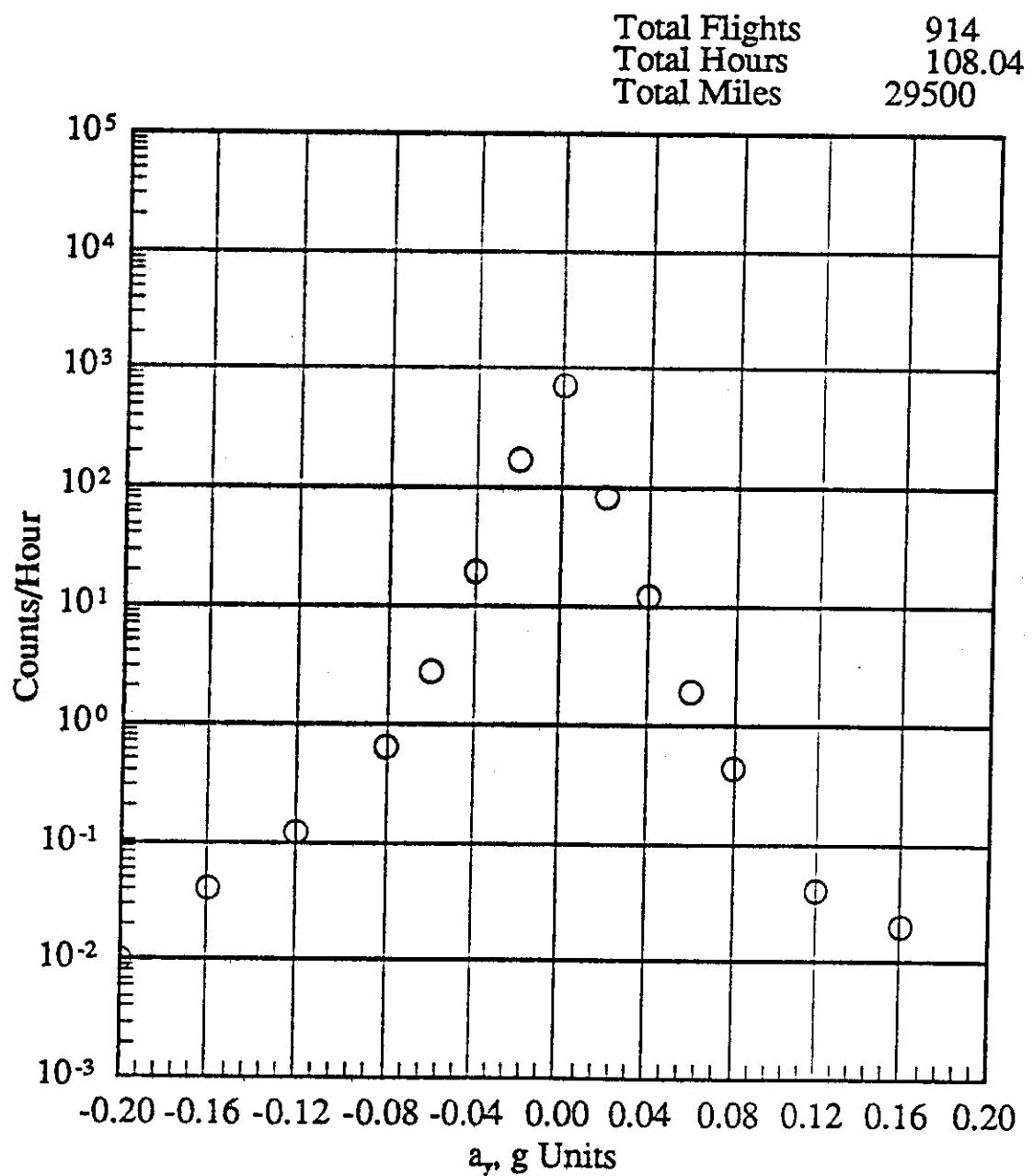
(a) a Level crossing counts per hour with in pressure altitude bands

Figure 14.- Lateral acceleration exceedances.



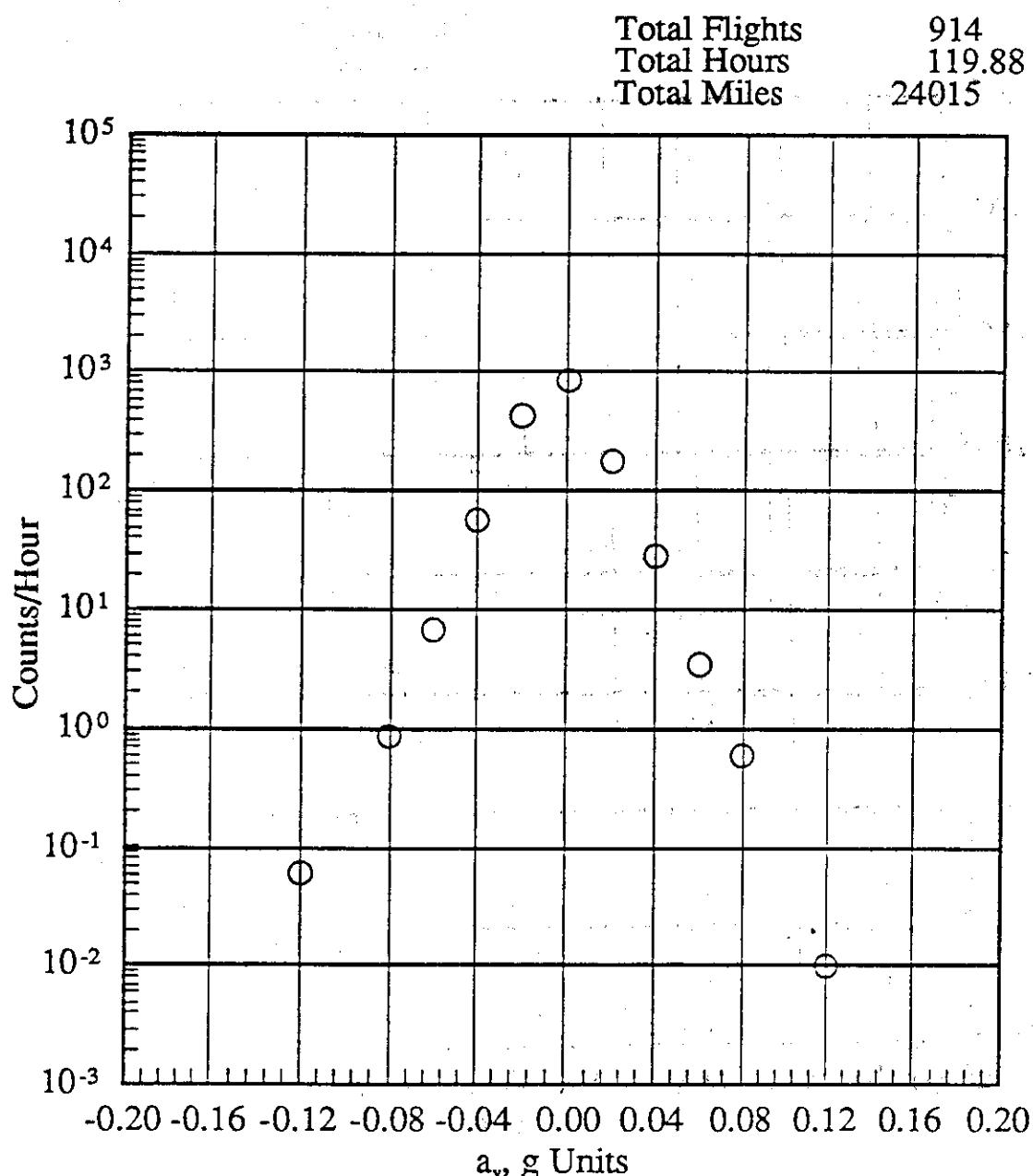
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 13.- Concluded.



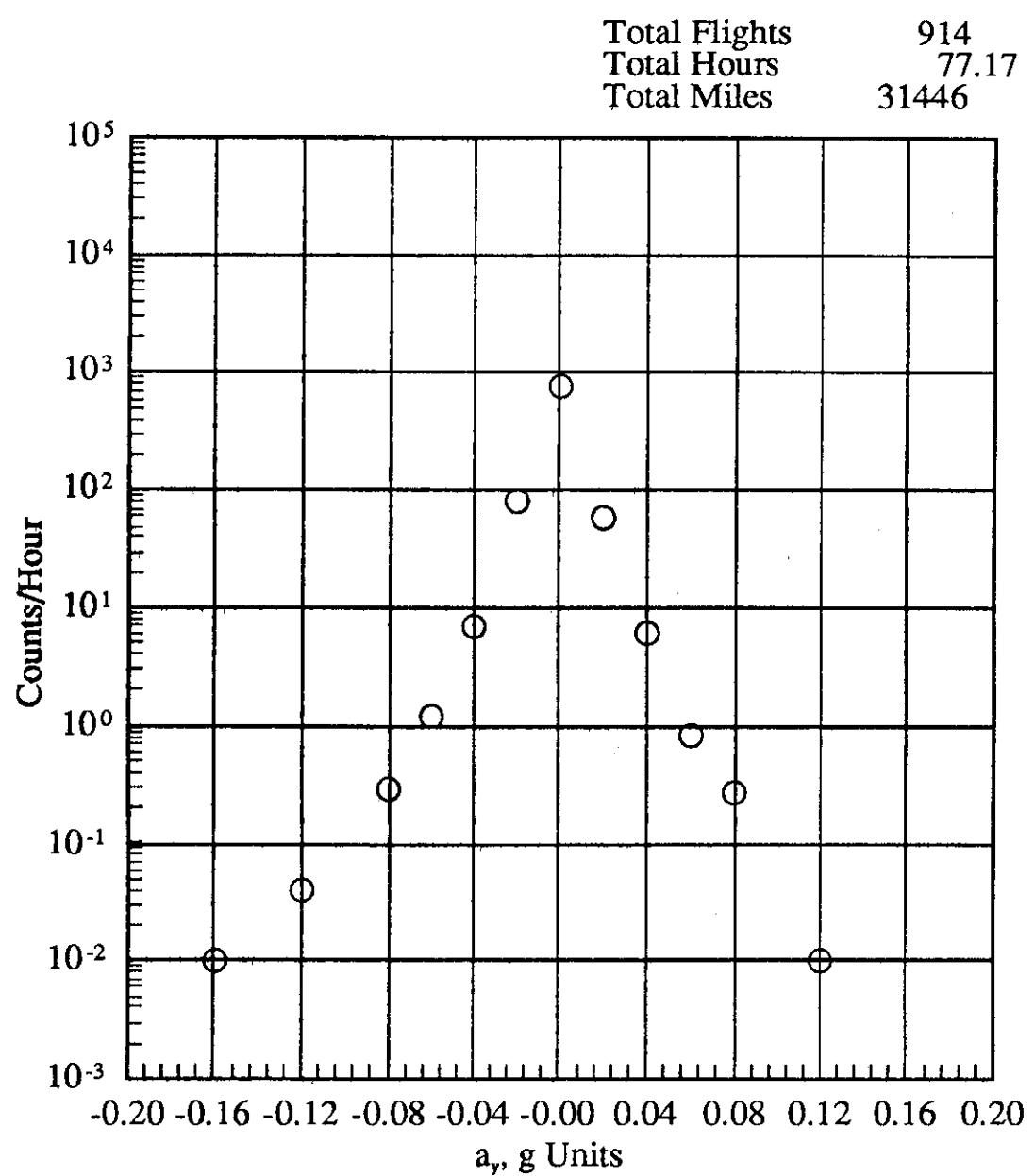
(c) 4500 to 9500 feet altitude

Figure 14.- Continued.



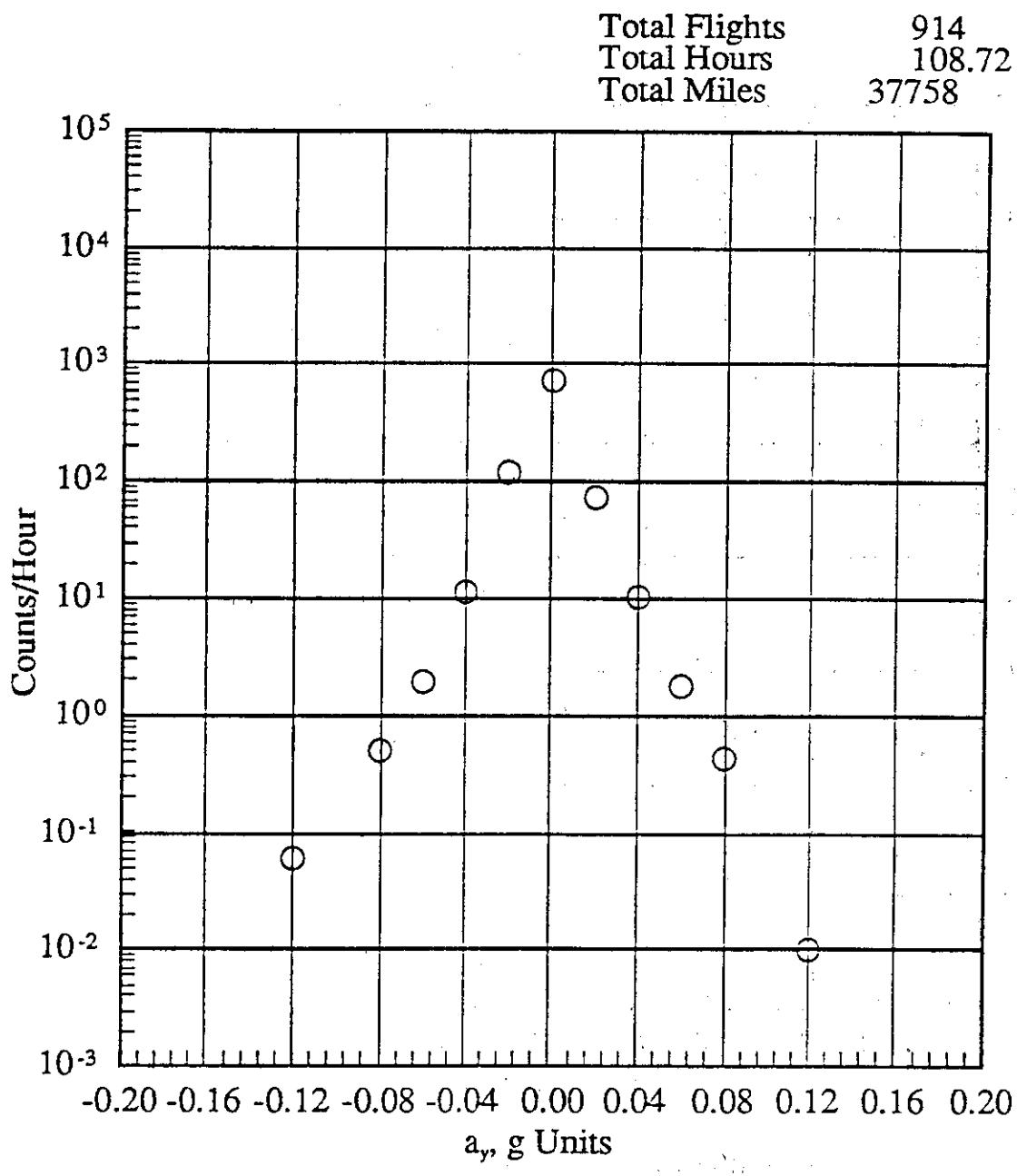
(b) -500 to 4500 feet altitude

Figure 14.- Continued.



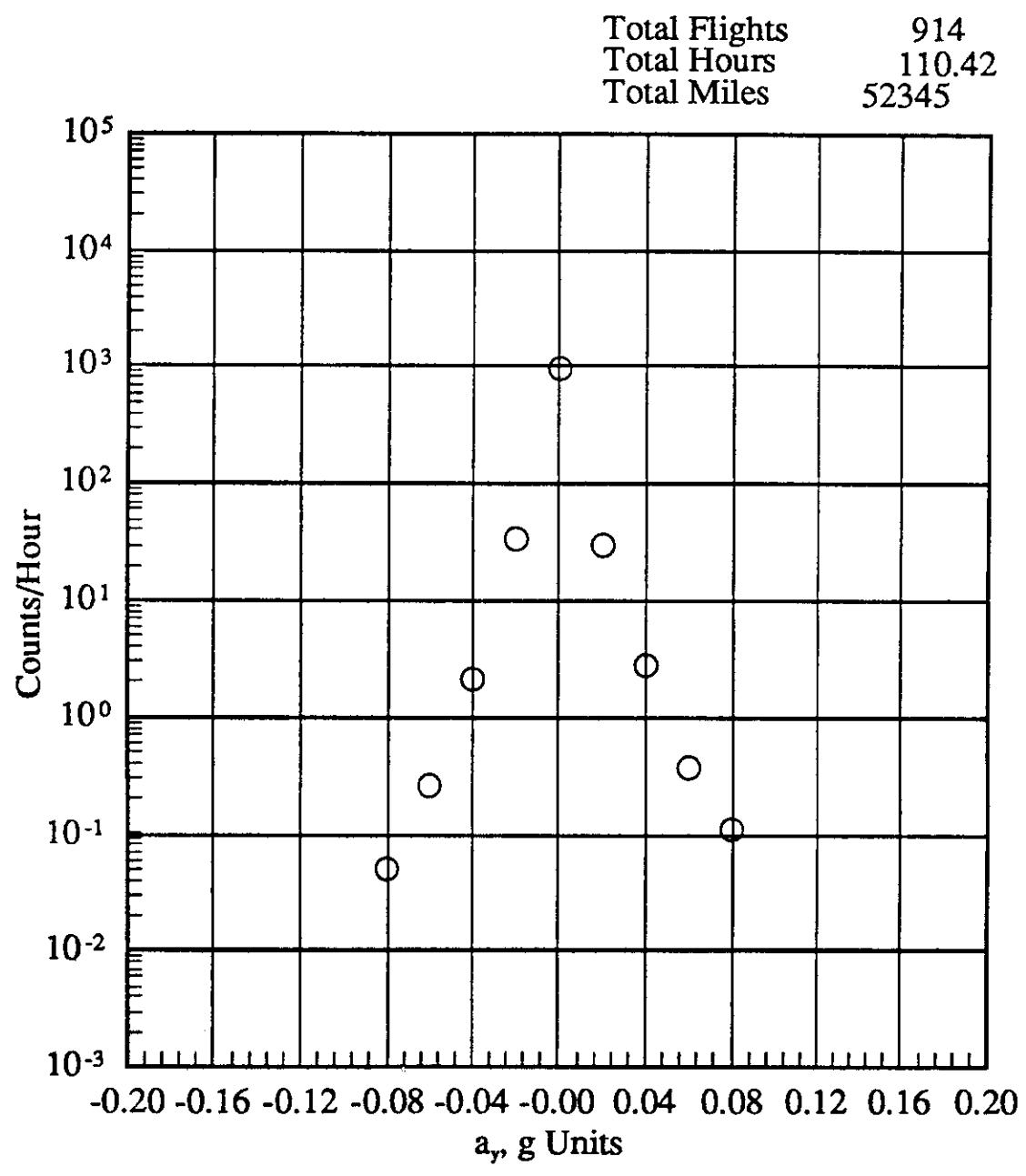
(e) 14500 to 19500 feet altitude

Figure 14.- Continued.



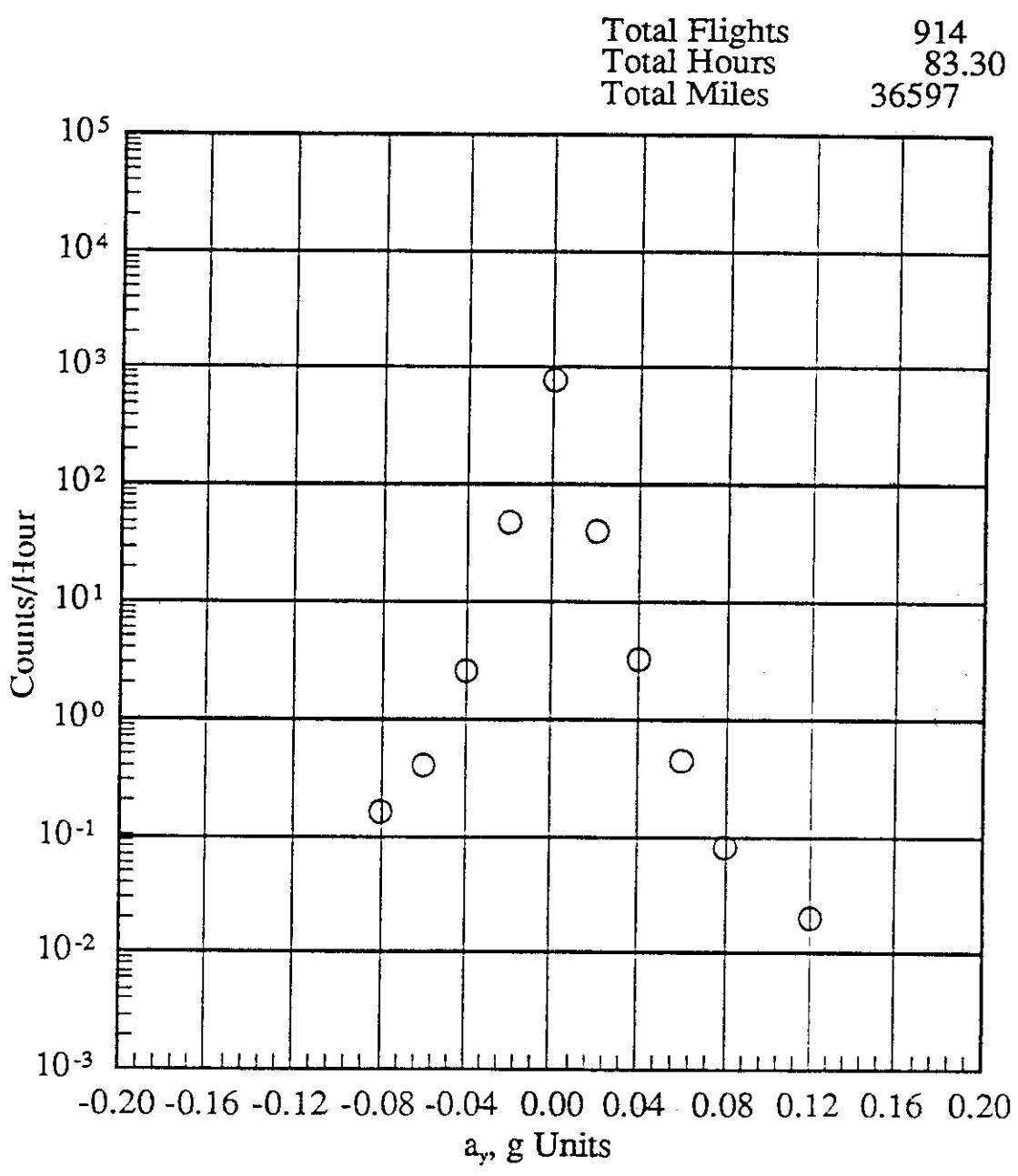
(d) 9500 to 14500 feet altitude

Figure 14.- Continued.



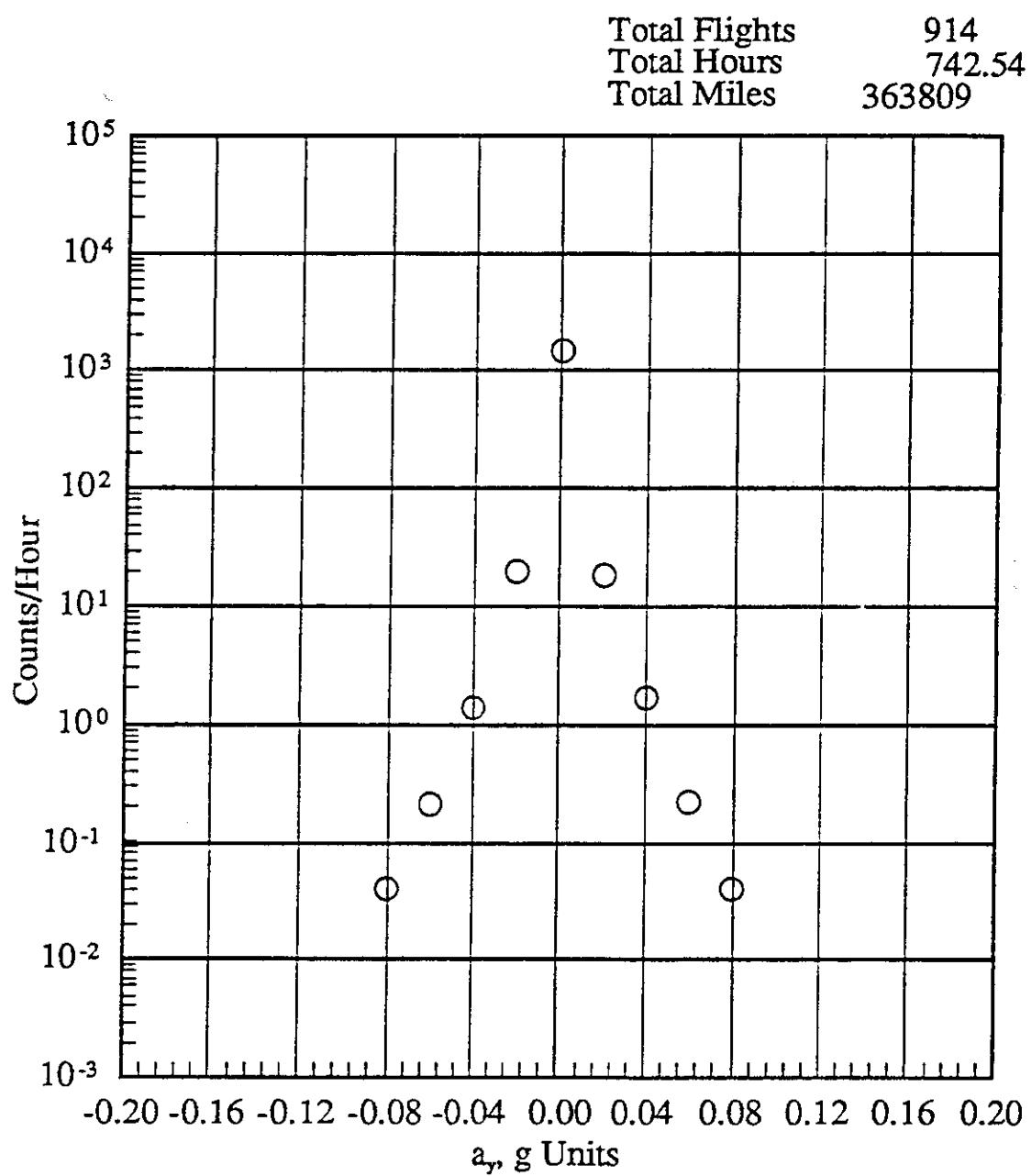
(g) 24500 to 29500 feet altitude

Figure 14.- Continued.



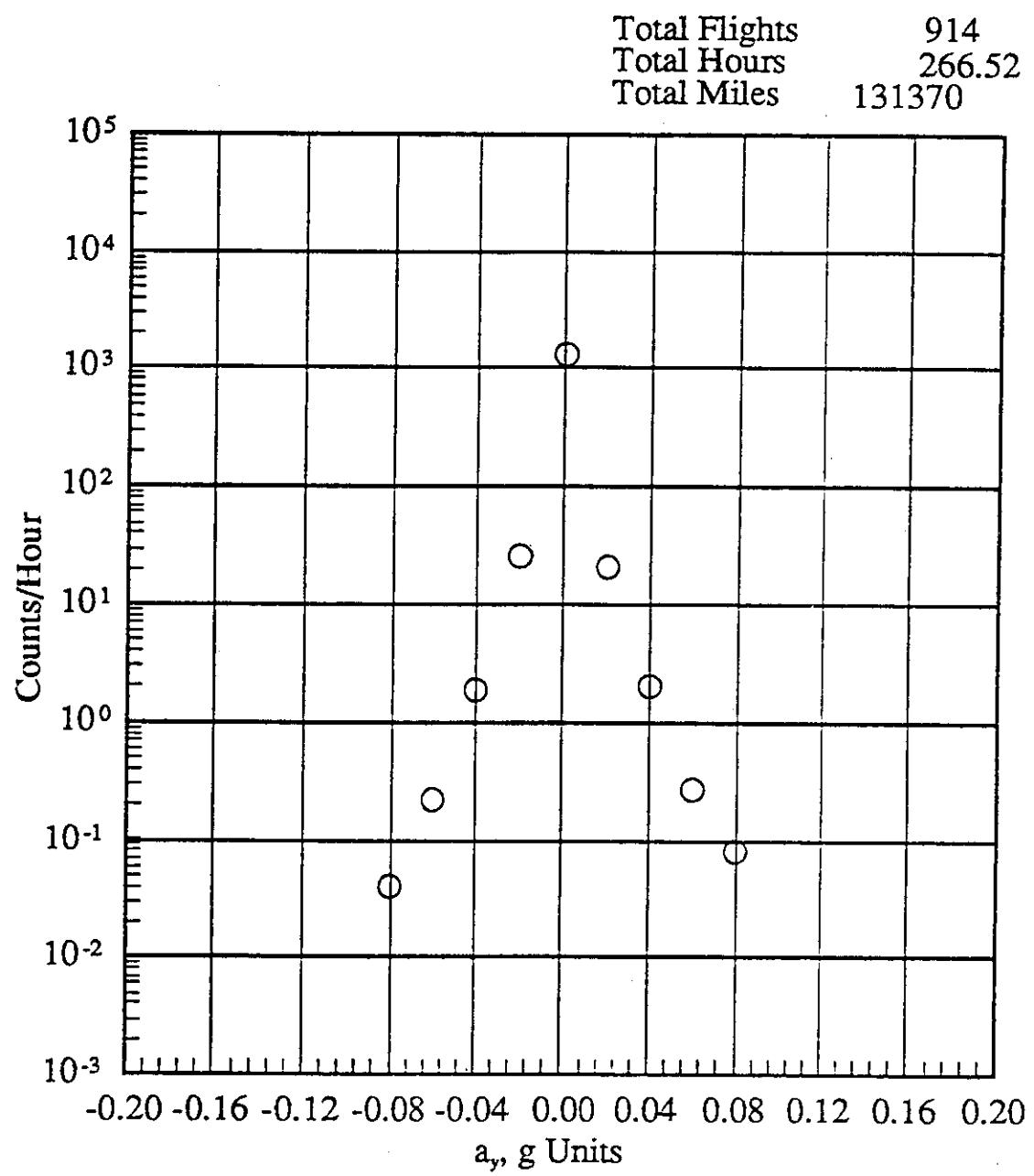
(f) 19500 to 24500 feet altitude

Figure 14.- Continued.



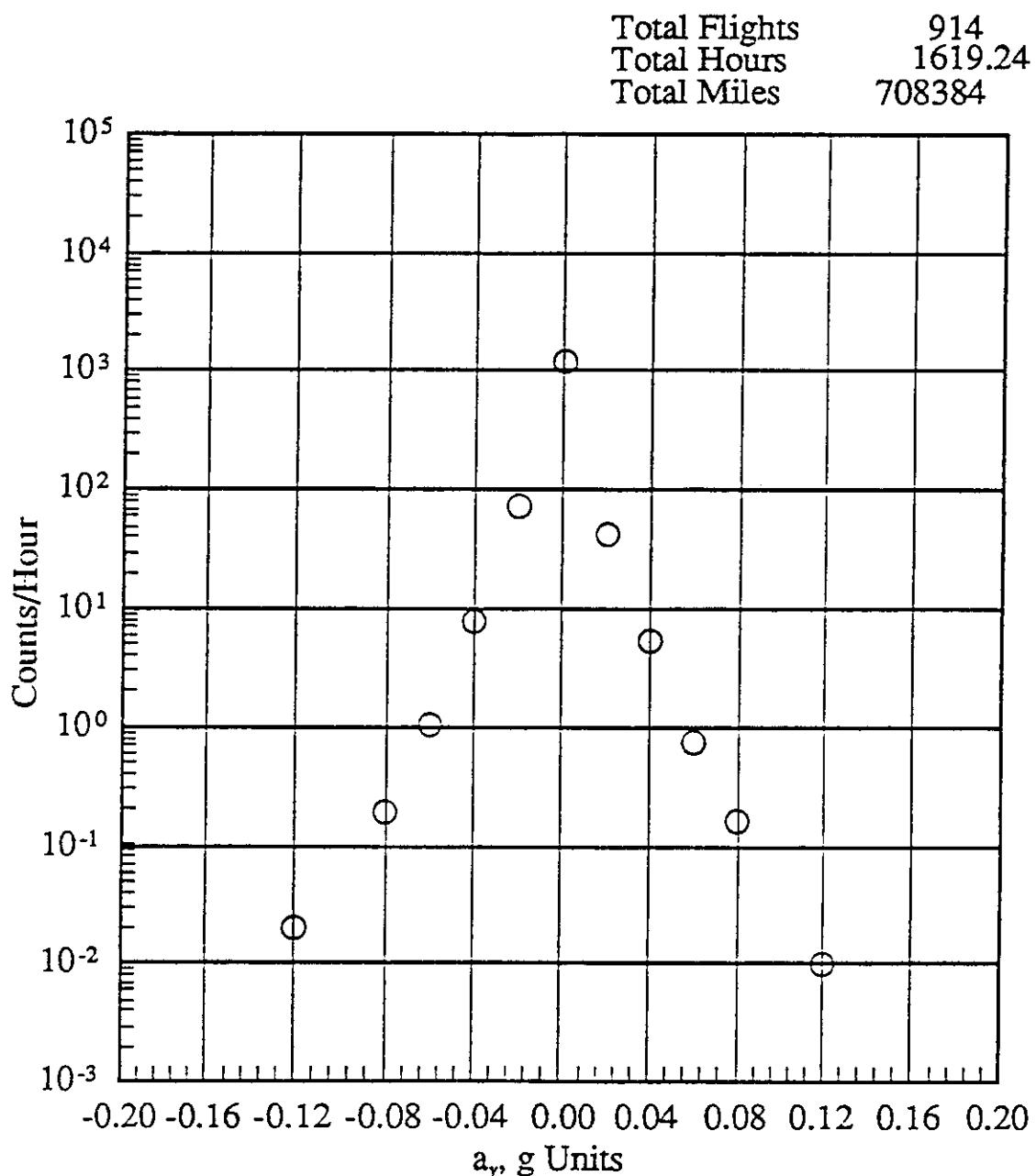
(i) 34500 to 39500 feet altitude

Figure 14.- Continued.



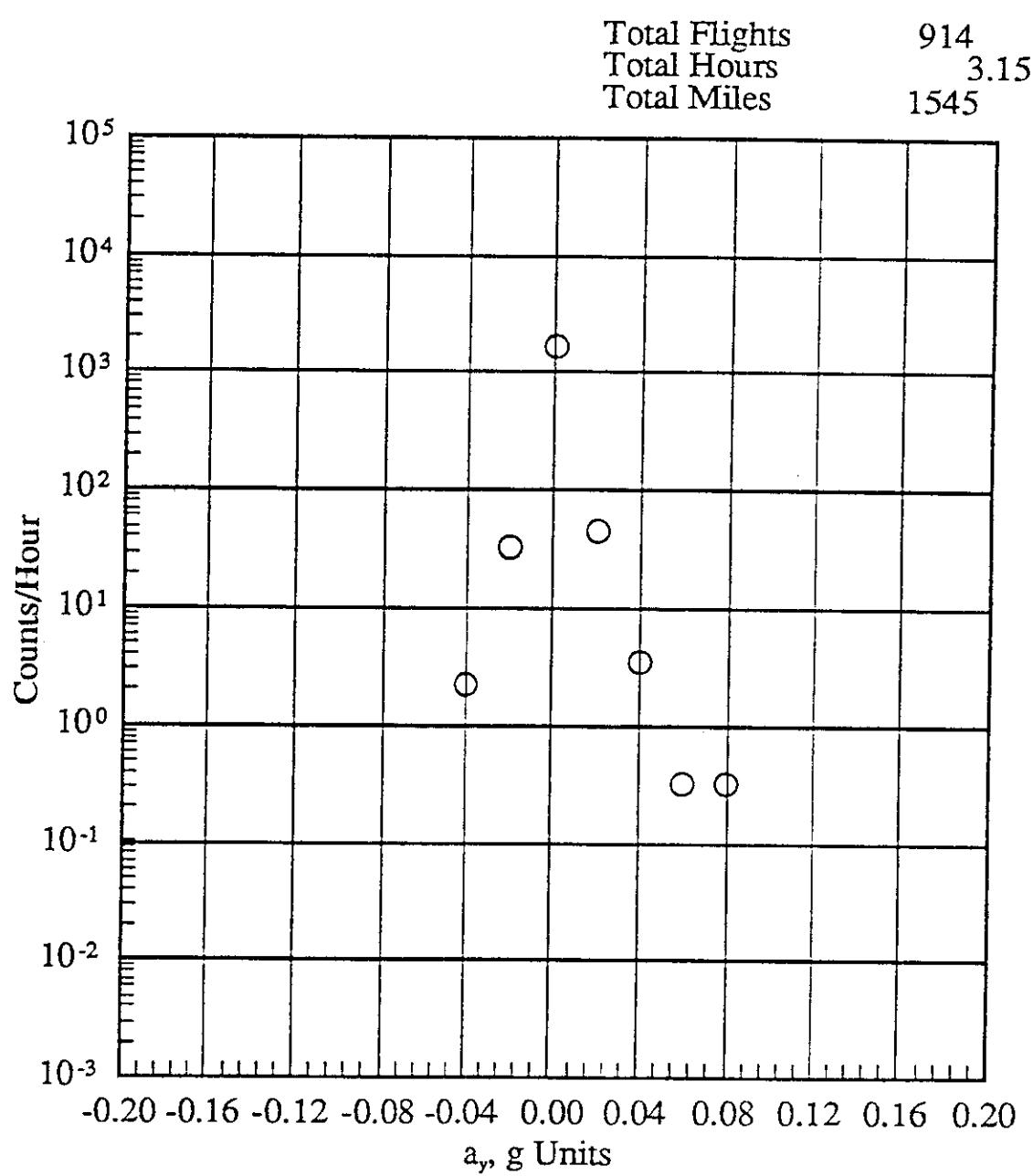
(h) 29500 to 34500 feet altitude

Figure 14.- Continued.



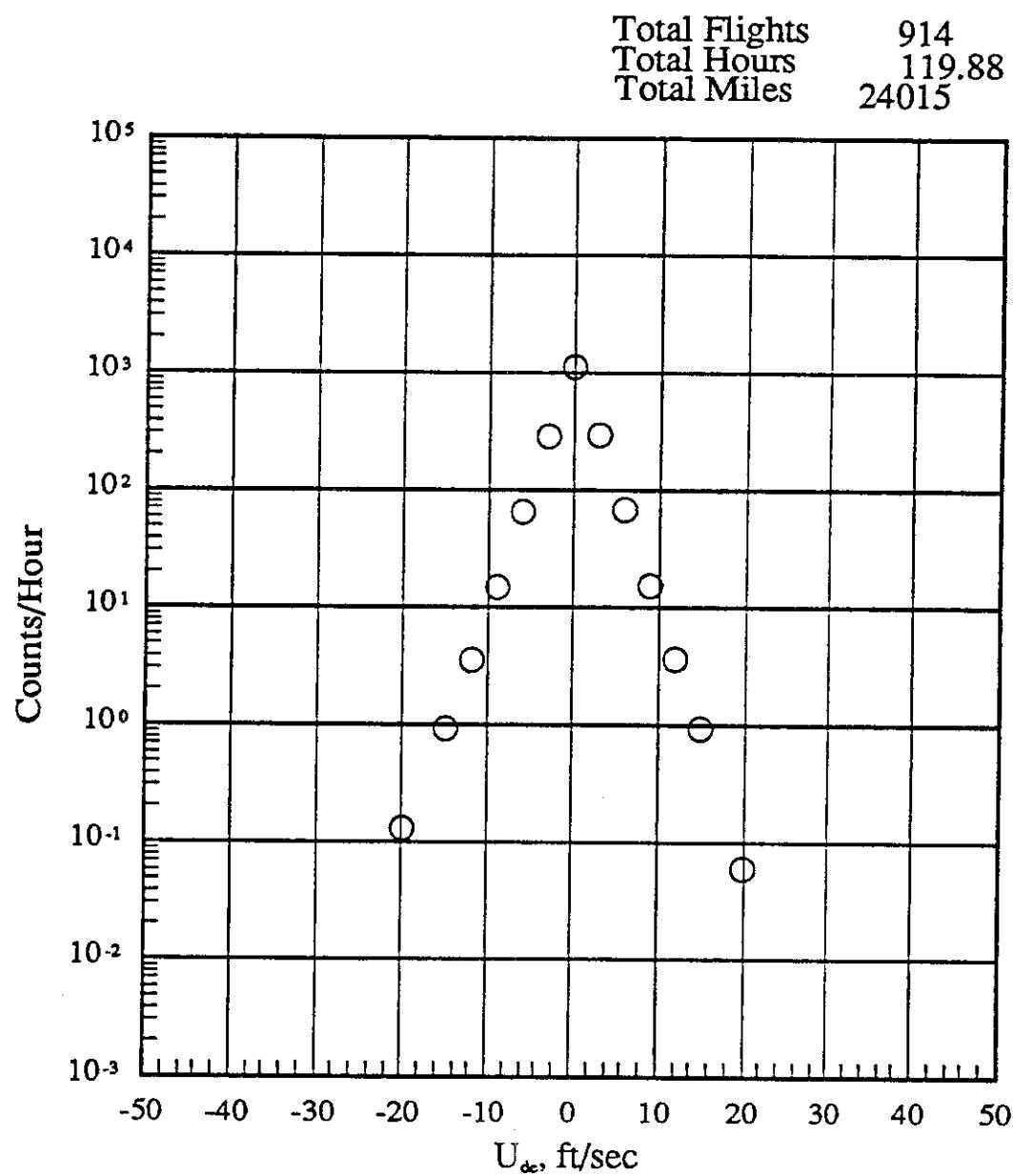
(k) -500 to 44500 feet altitude

Figure 14.- Concluded.



(j) 39500 to 44500 feet altitude

Figure 14.- Continued.



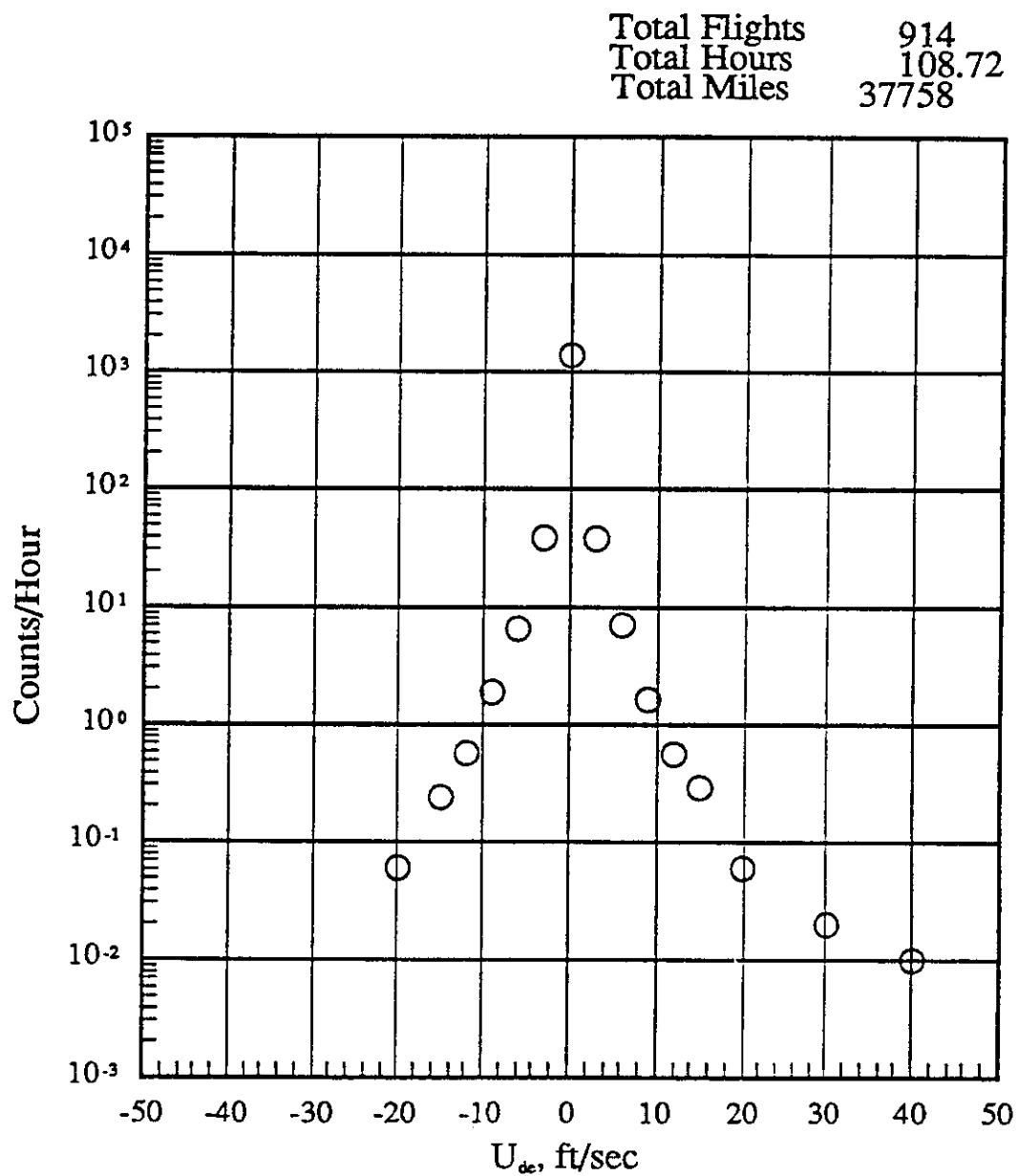
(b) -500 to 4500 feet altitude

Figure 15.- Continued.

## PRESSURE ALTITUDE BANDS

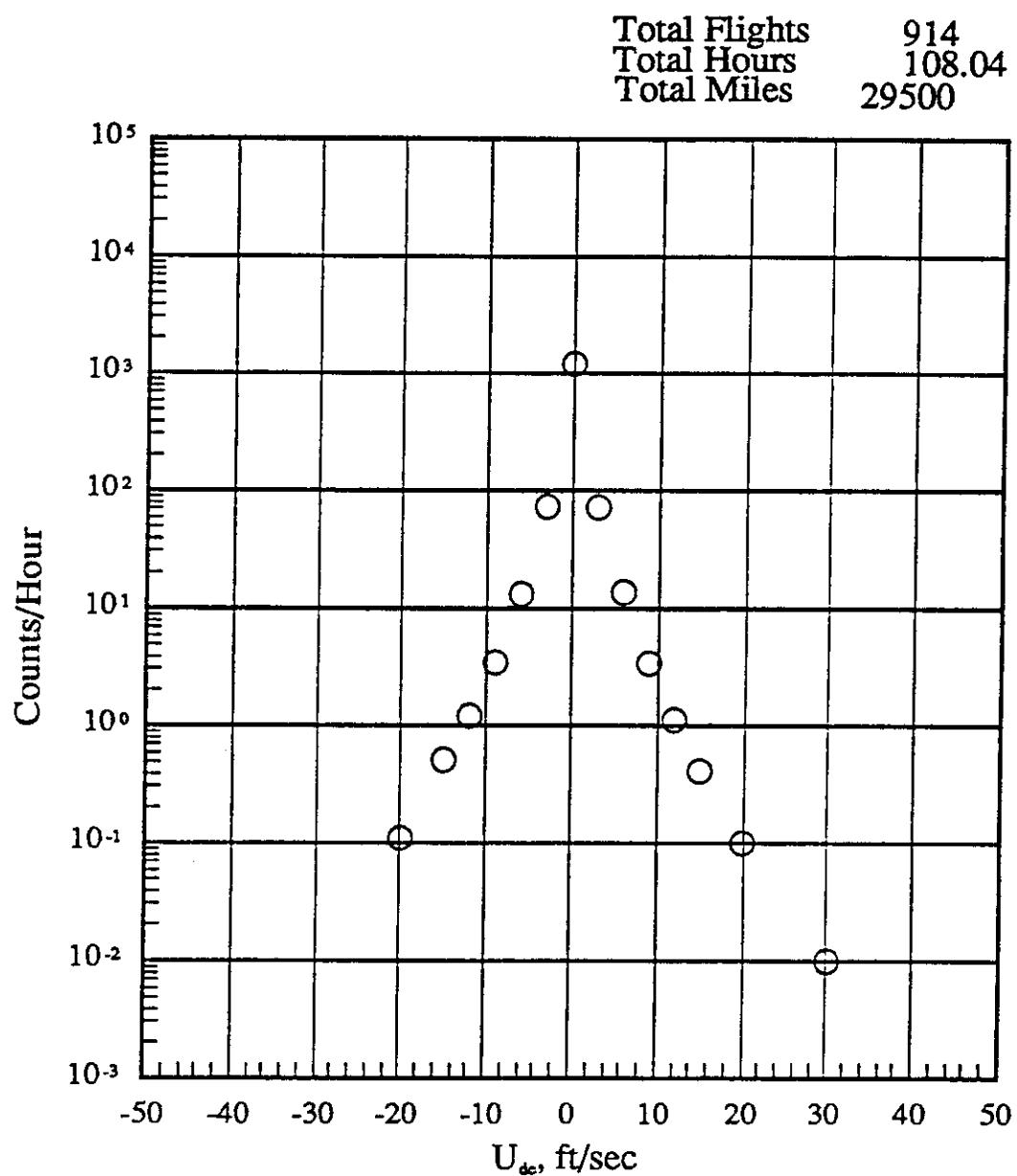
DERIVED GUST FT/SEC	PRESSURE ALTITUDE BANDS										-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 49500 FT										
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
40	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	0	0.01	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
20	0.06	0.10	0.06	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	
15	0.94	0.41	0.29	0.13	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0.12	
12	3.64	1.12	0.56	0.26	0.04	0.01	0	0	0	0.03	0	0	0	0	0	0	0	0	0.40	
9	15.31	3.41	1.64	0.71	0.11	0.04	0.09	0.02	0	0	0	0	0	0	0	0	0	0	1.53	
6	67.82	13.76	7.06	2.73	0.71	0.38	0.40	0.21	0	0	0	0	0	0	0	0	0	0	6.75	
3	294.80	71.46	38.04	18.43	8.18	5.41	4.93	4.30	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	33.51	
0	1121.52	1205.66	1383.02	1505.45	1602.97	1623.82	1647.05	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1651.64	1552.74	
-3	286.81	72.53	38.67	19.37	8.34	5.30	4.78	4.14	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	32.98	
-6	64.94	13.24	6.55	2.67	0.77	0.37	0.36	0.20	0	0	0	0	0	0	0	0	0	0	6.45	
-9	14.83	3.46	1.89	0.67	0.14	0.06	0.06	0.03	0	0	0	0	0	0	0	0	0	0	1.52	
-12	3.55	1.21	0.57	0.17	0.04	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0.40	
-15	0.93	0.51	0.24	0.08	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.12	
-20	0.13	0.11	0.06	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	
-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	1619.24	
FLIGHT MILES @ ALT	24014.89	29500.10	37757.93	31445.86	36596.70	52344.52	131369.92	363808.53	1545.14	1545.14	1545.14	1545.14	1545.14	1545.14	1545.14	1545.14	1545.14	1545.14	708383.60	
TOTAL FLIGHTS	914																			
TOTAL FLIGHT HOURS	1619.24																			
FLAPS UP AND DOWN	708383.60																			

(a)  $U_{de}$  Level crossing counts per hour within pressure altitude bands.Figure 15.-  $U_{de}$  Exceedances



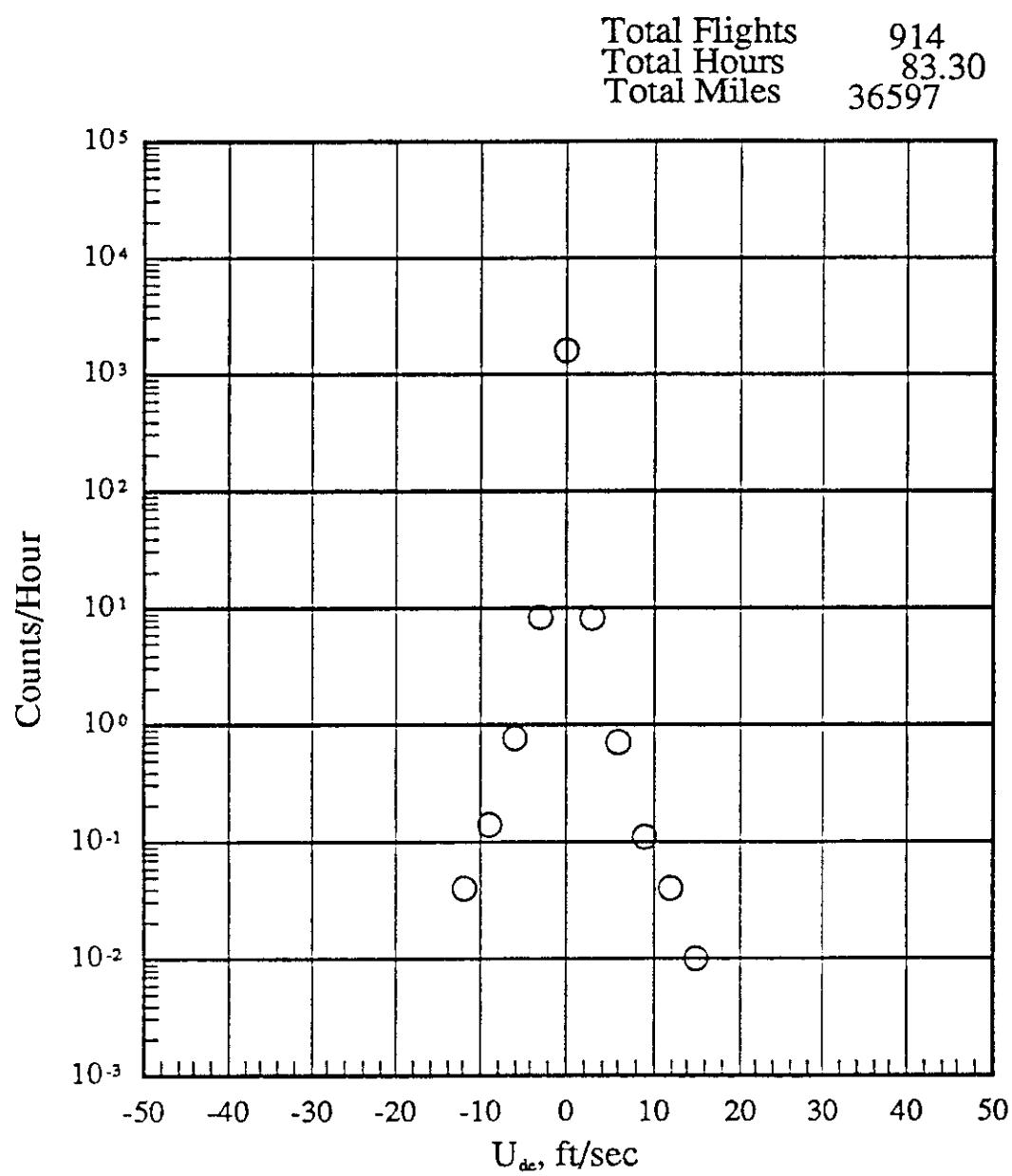
(d) 9500 to 14500 feet altitude

Figure 15.- Continued.



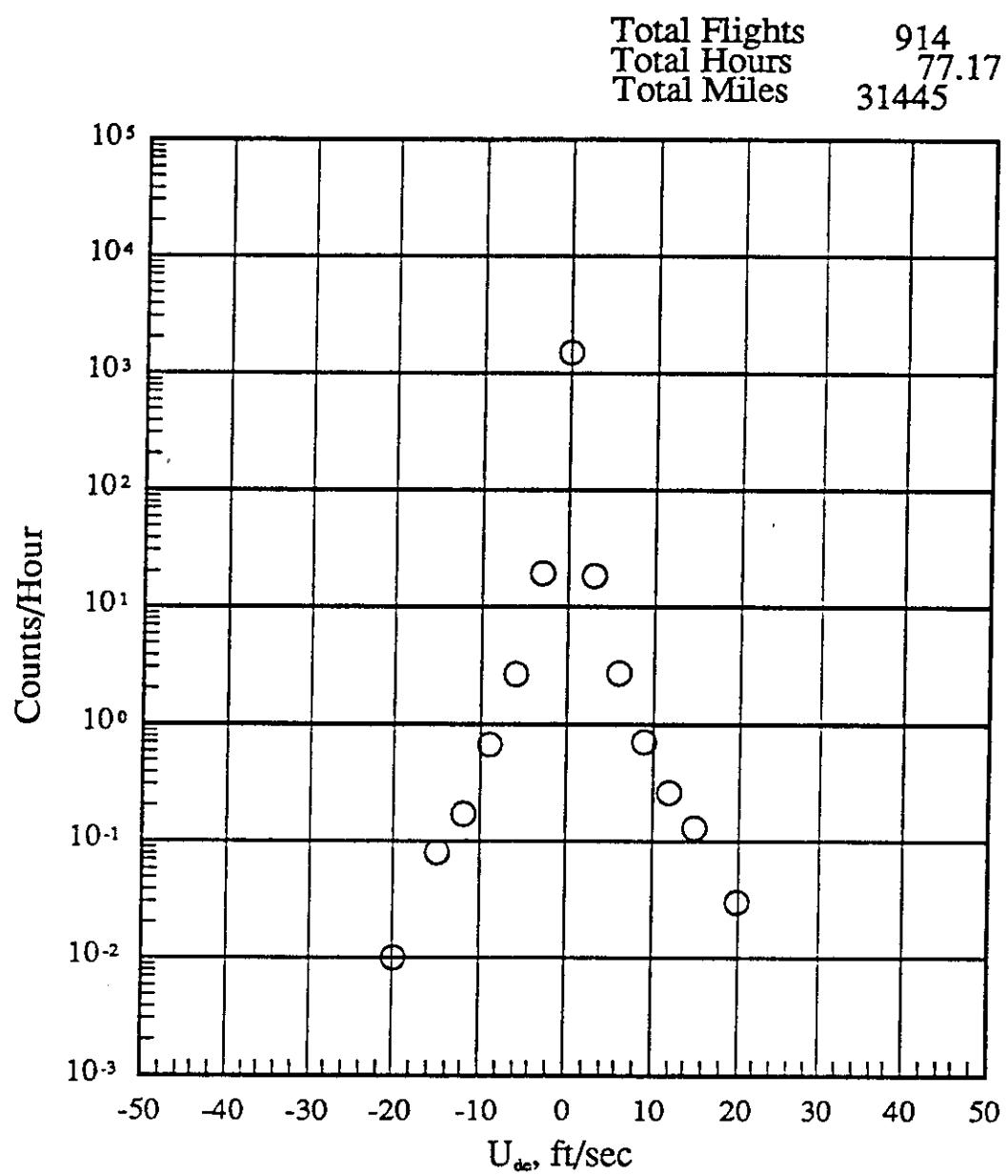
(c) 4500 to 9500 feet altitude

Figure 15.- Continued.



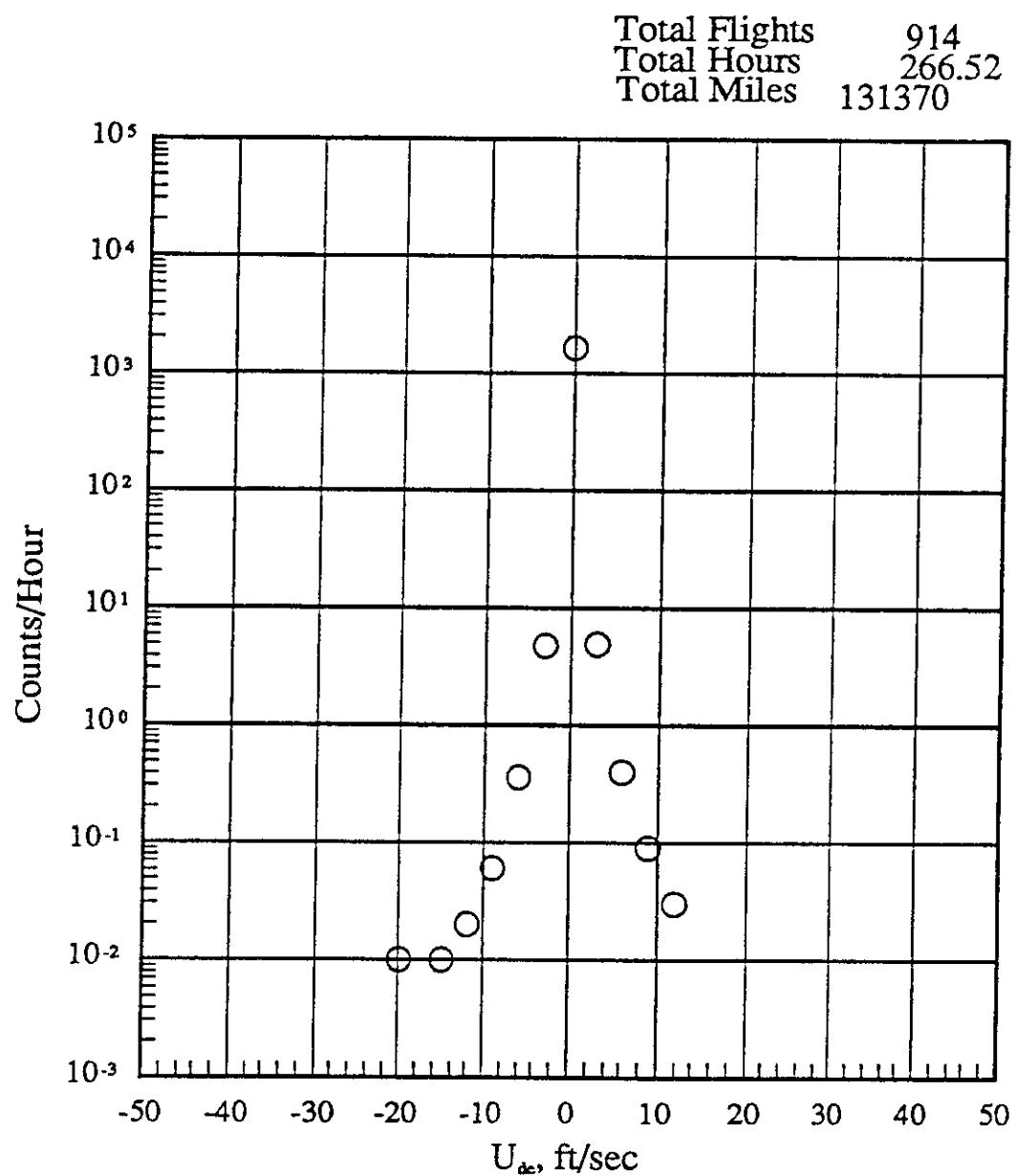
(f) 19500 to 24500 feet altitude

Figure 15.- Continued.



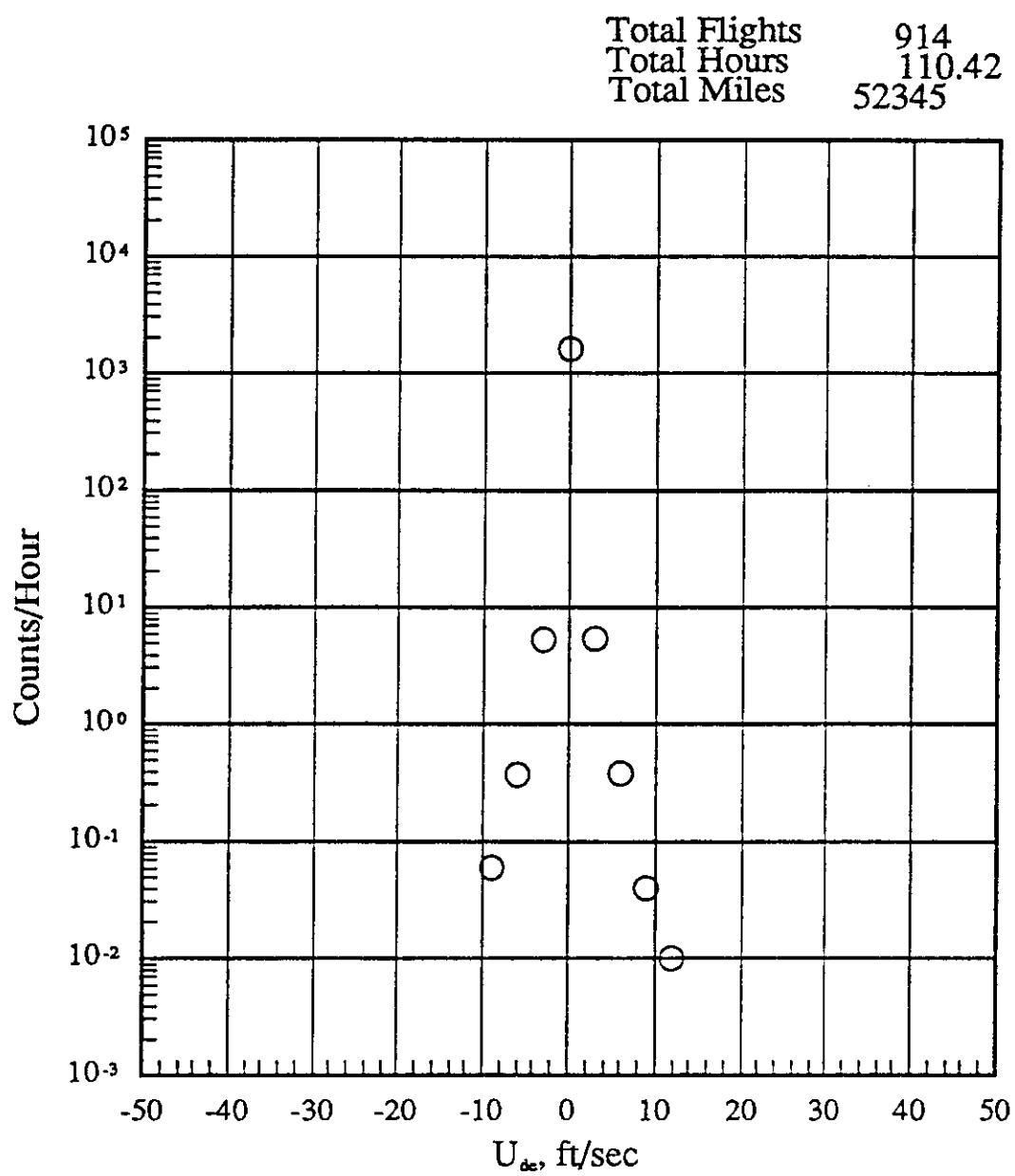
(e) 14500 to 19500 feet altitude

Figure 15.- Continued.



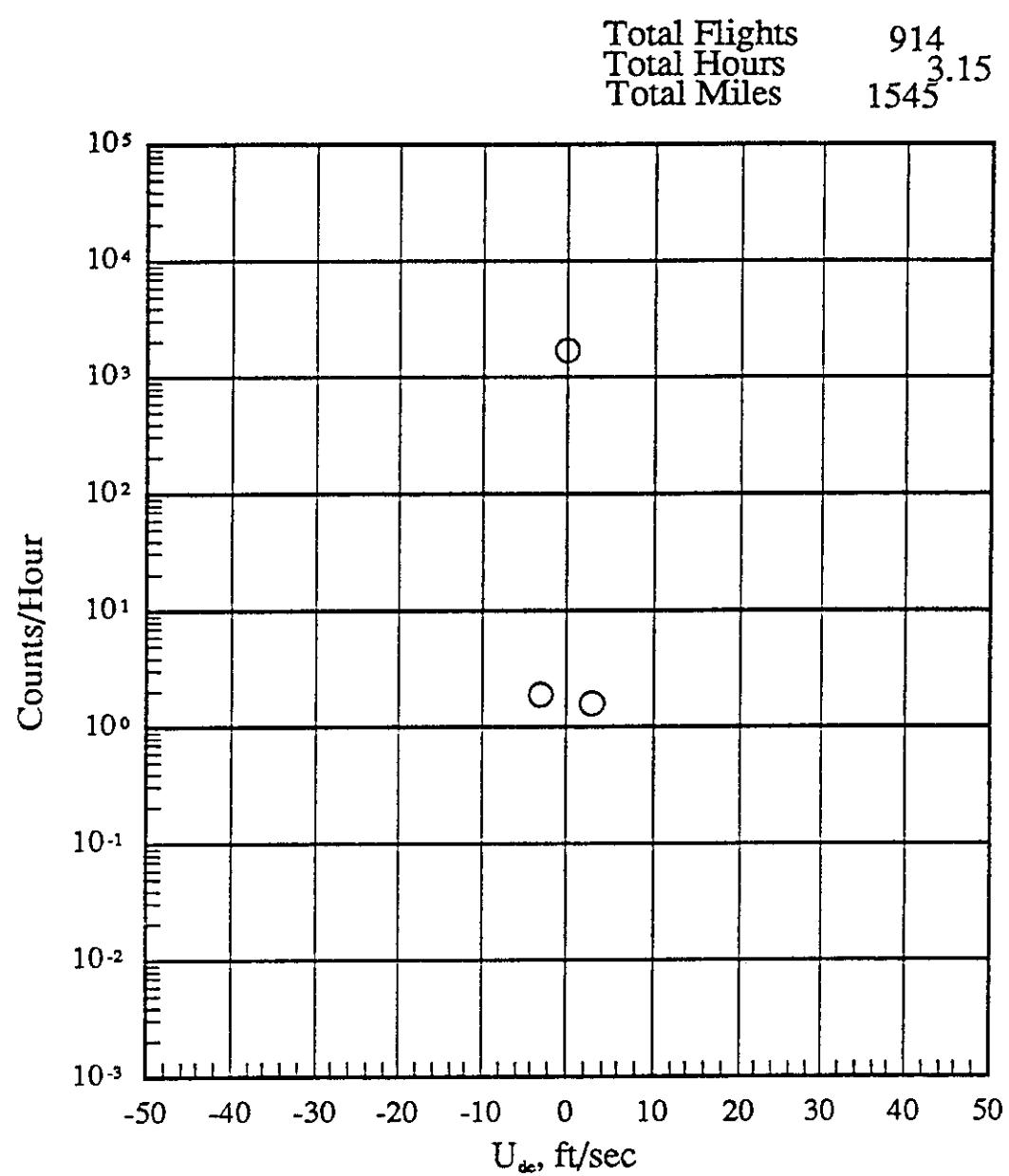
(h) 29500 to 34500 feet altitude

Figure 15.- Continued.



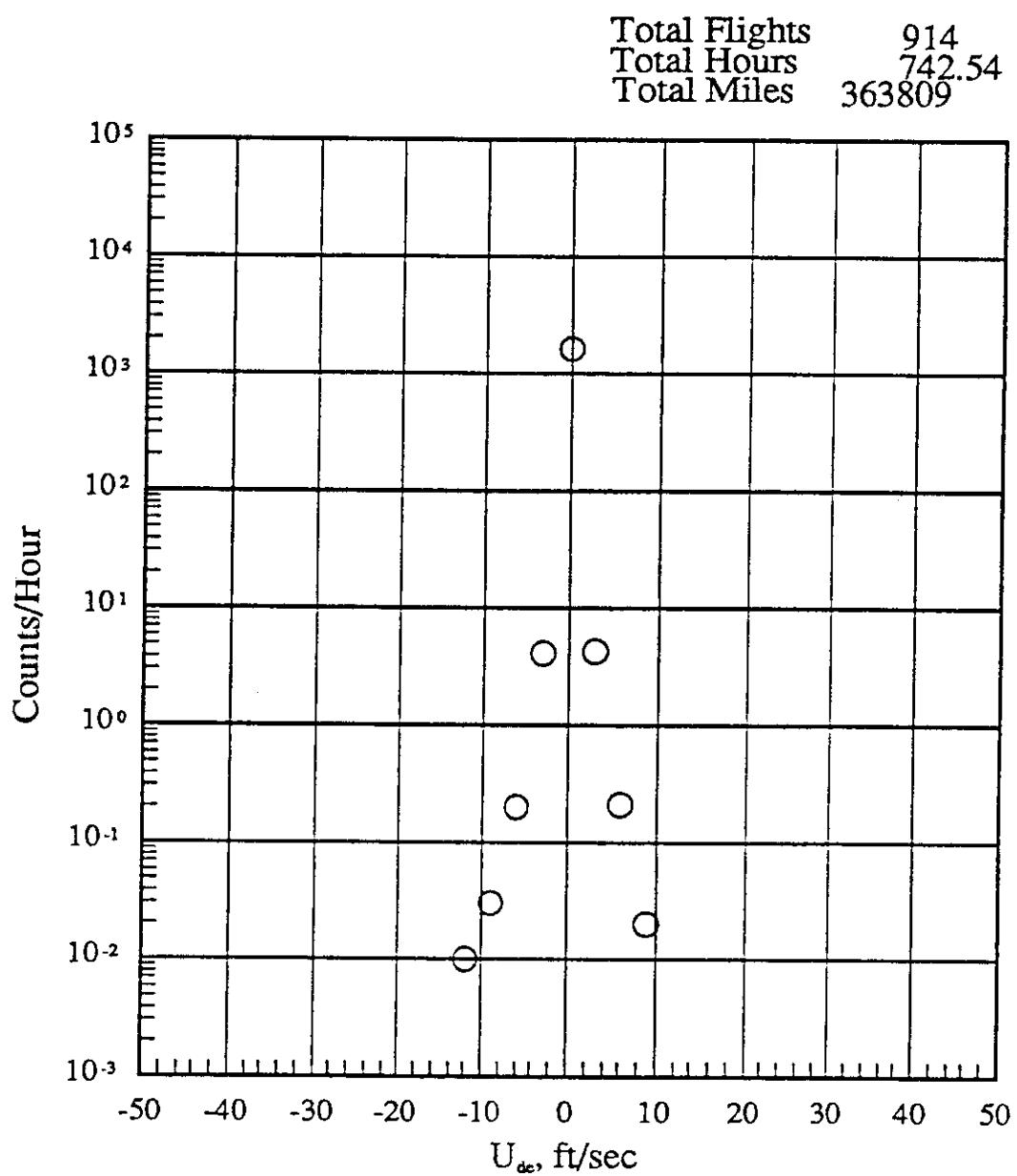
(g) 24500 to 29500 feet altitude

Figure 15.- Continued.



(j) 39500 to 44500 feet altitude

Figure 15.- Continued.



(i) 34500 to 39500 feet altitude

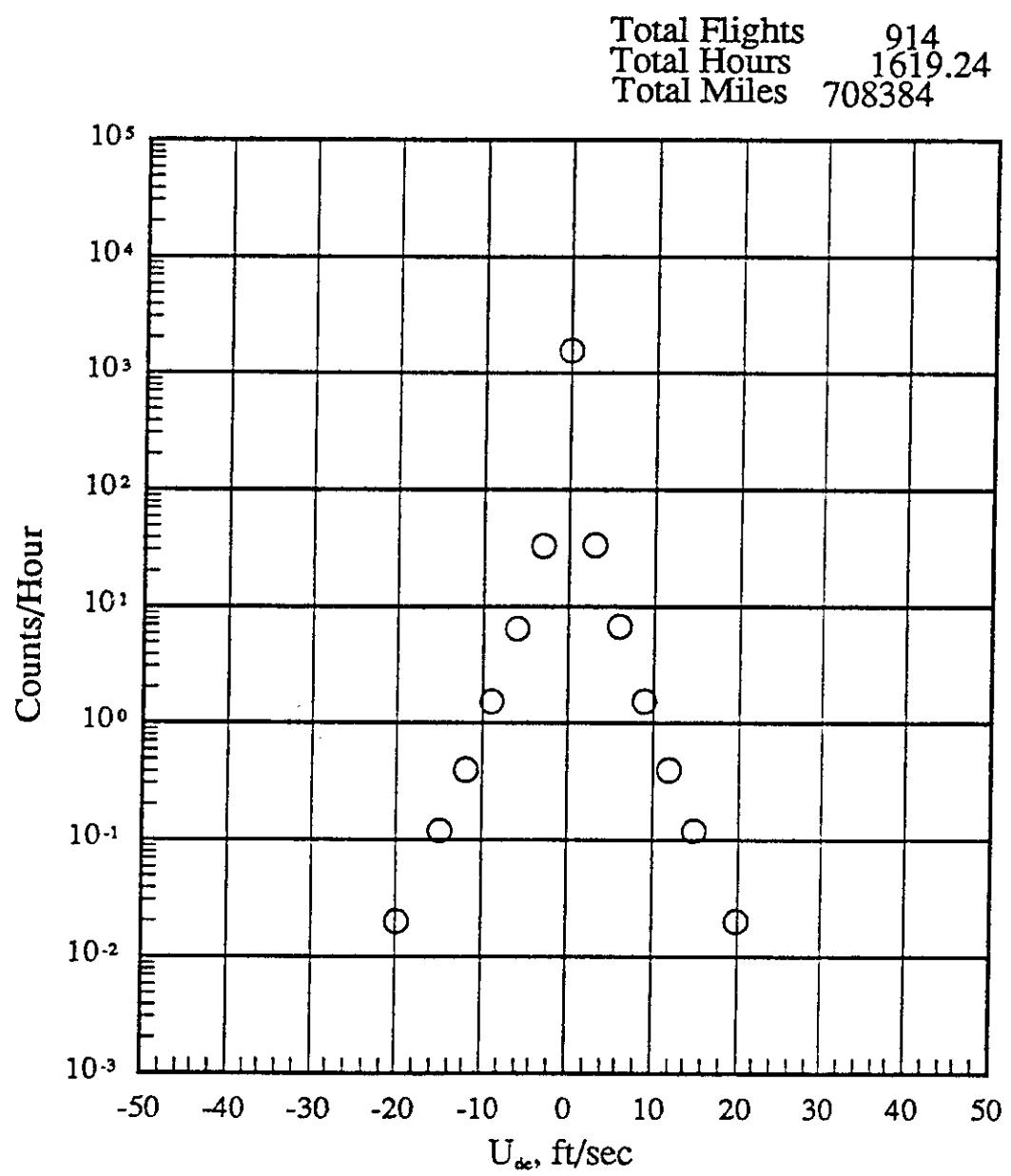
Figure 15.- Continued.

## PRESSURE ALTITUDE BANDS

MAXIMUM $a_n$ LEVEL FOR EACH FLIGHT G's FROM	PRESSURE ALTITUDE BANDS										TOTAL FLIGHTS
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT	
1.60	1.80	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0.1	0.1	0	0	0	0	0	0.2	0
.70	0.80	0	0.1	0	0	0	0	0	0	0.1	0
.60	0.70	0	0.2	0	0.1	0	0	0	0	0.4	0
.50	0.60	0	0.2	0.4	0.2	0	0	0.2	0	0	1.1
.40	0.50	1.2	1.3	0.9	0.2	0.1	0.1	0.3	0.2	4.4	0
.30	0.40	8.6	4.0	2.1	1.4	0.7	0.1	0.2	0.8	17.9	0
.20	0.30	25.1	11.9	5.6	2.5	0.8	1.1	1.3	3.6	51.9	0
.15	0.20	10.2	4.0	1.8	1.0	0.2	0.2	0.9	0.9	19.1	0
.10	0.15	2.5	1.4	0.5	0.1	0	0.1	0.1	0	4.8	0
.05	0.10	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
-.05	-.010	0	0	0	0	0	0	0	0	0	0
-.10	-.015	8.1	3.5	2.1	0.7	0.7	0.2	0.3	1.2	0	16.7
-.15	-.020	14.9	5.9	3.6	1.4	0.7	0.8	0.9	2.0	0	30.1
-.20	-.030	17.4	6.5	5.9	2.5	1.2	1.6	2.3	3.4	0	40.8
-.30	-.040	2.6	1.9	0.8	0	0.1	0.9	0.5	0	8.6	0
-.40	-.050	0.4	0.7	0.4	0.1	0.2	0	0.1	0.3	0	2.3
-.50	-.060	0	0.2	0.3	0.2	0	0	0	0	0.8	0
-.60	-.070	0	0.2	0	0.1	0	0	0.1	0	0.4	0
-.70	-.080	0	0.1	0	0	0	0	0	0	0.1	0
-.80	-.100	0	0	0	0	0	0.1	0	0	0.1	0
-.90	-.120	0	0	0	0	0	0	0	0	0	0
-.100	-.140	0	0	0	0	0	0	0	0	0	0
-.120	-.160	0	0	0	0	0	0	0	0	0	0
-.140	-.180	0	0	0	0	0	0	0	0	0	0
-.160	-.200	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24	
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.5	131369.93	363808.56	1545.14	708383.64	
TOTAL FLIGHTS											914

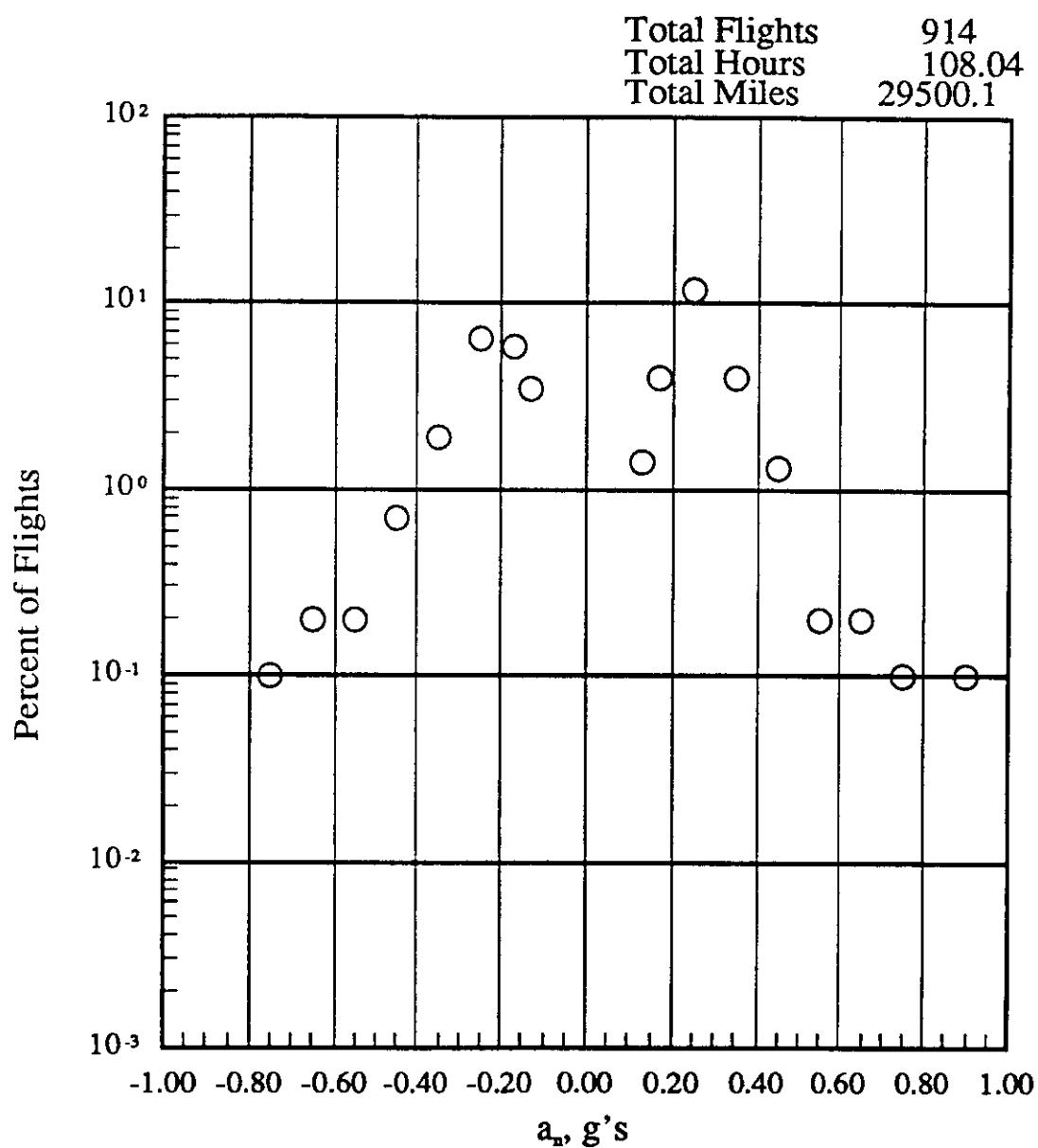
(a) Percent of flights where peak positive and negative  $a_n$  per flight occurs within pressure altitude bands, any flap

Figure 16.- Peak positive and negative  $a_n$  vs altitude.



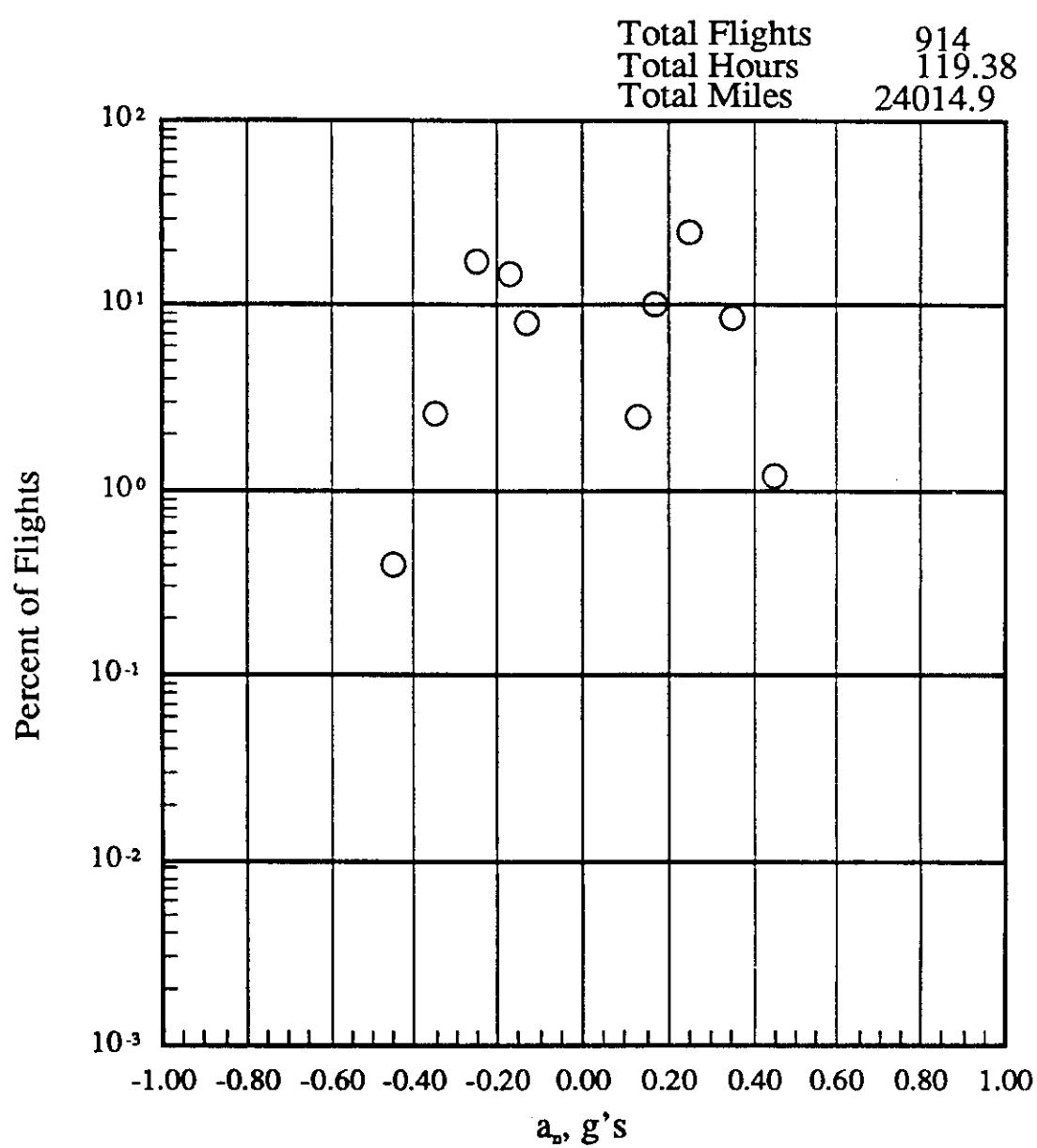
(k) -500 to 44500 feet altitude

Figure 15.- Concluded



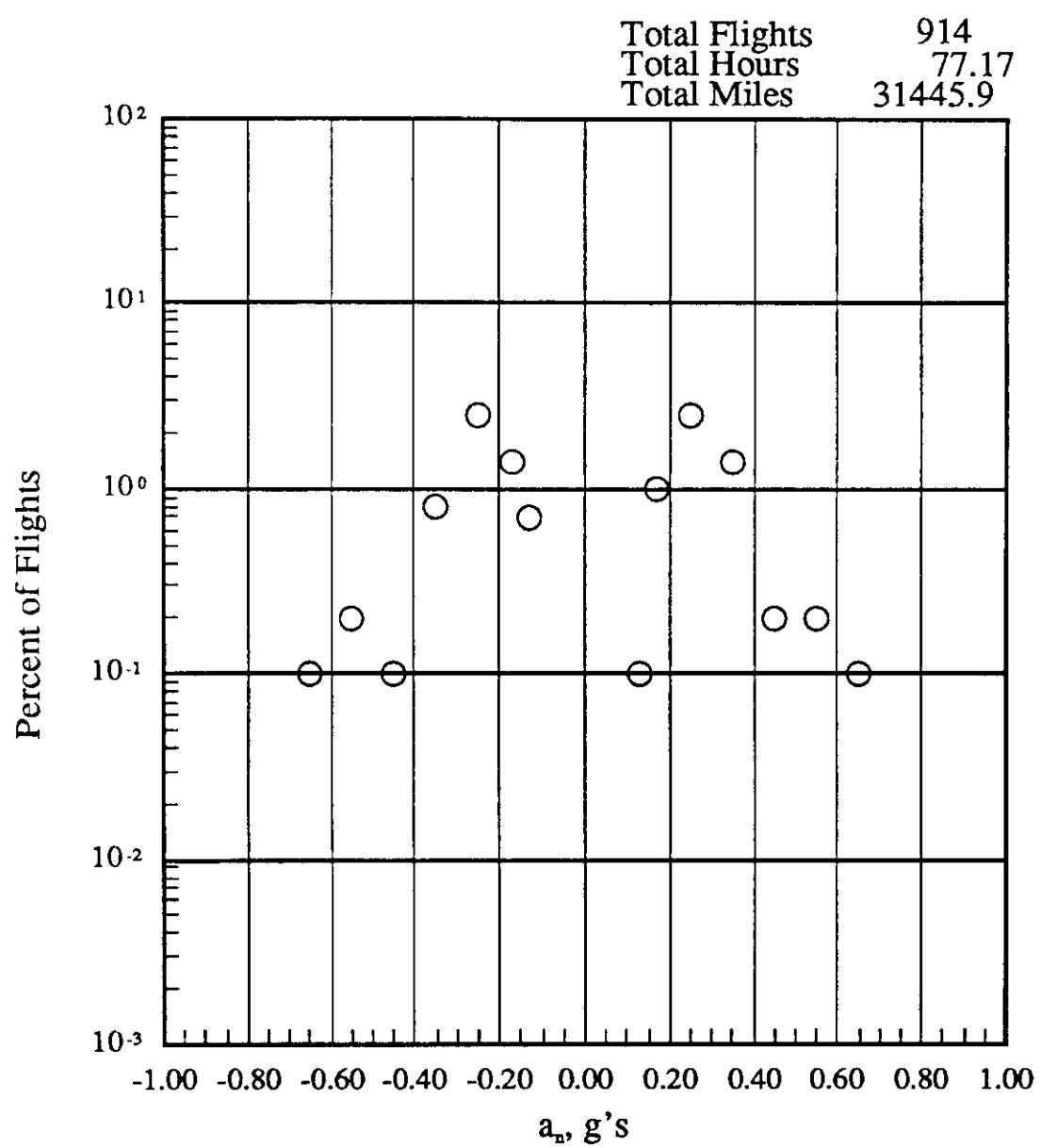
(c) 4500 to 9500 feet altitude

Figure 16.- Continued.



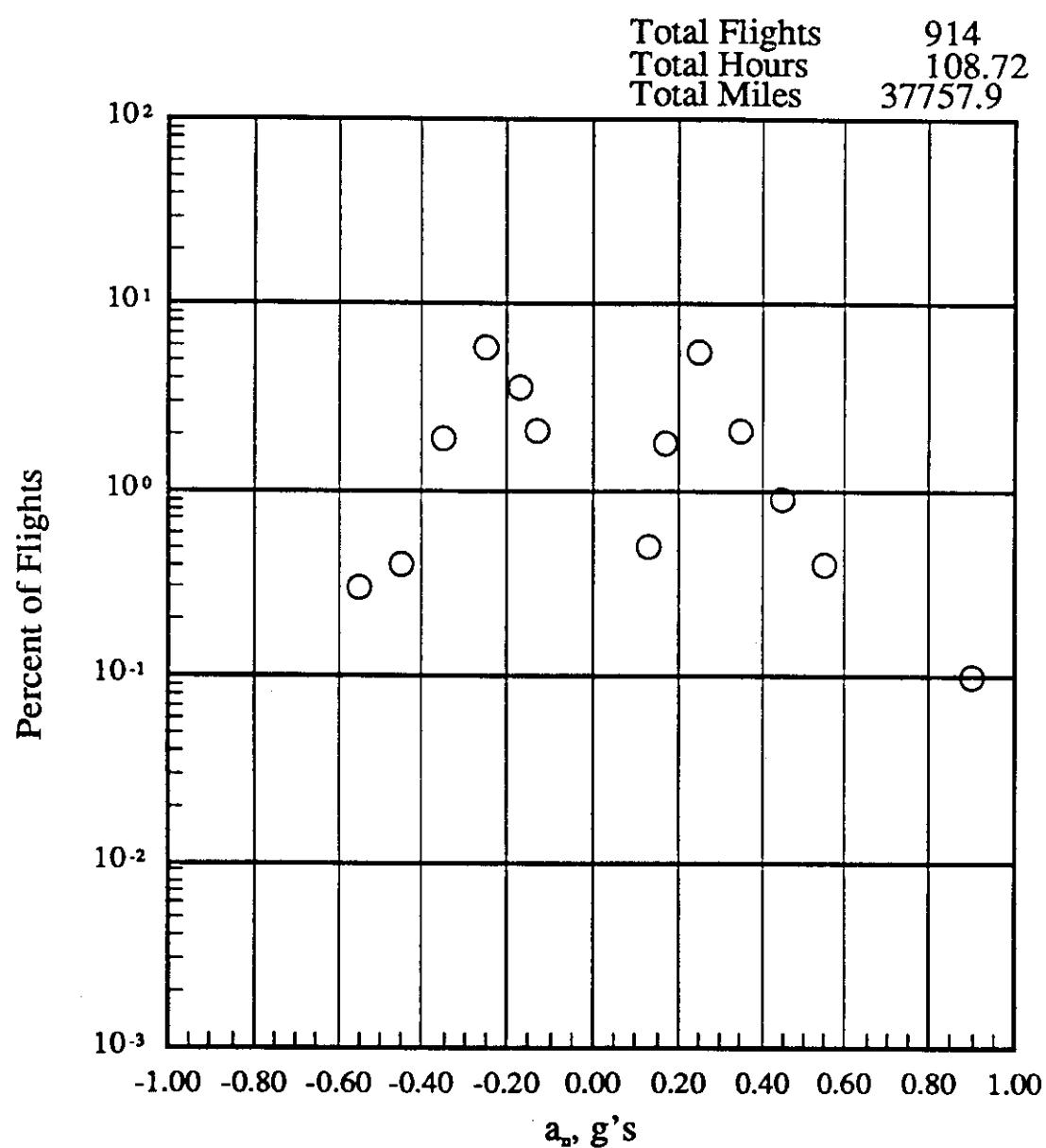
(b) -500 to 4500 feet altitude

Figure 16.- Continued.



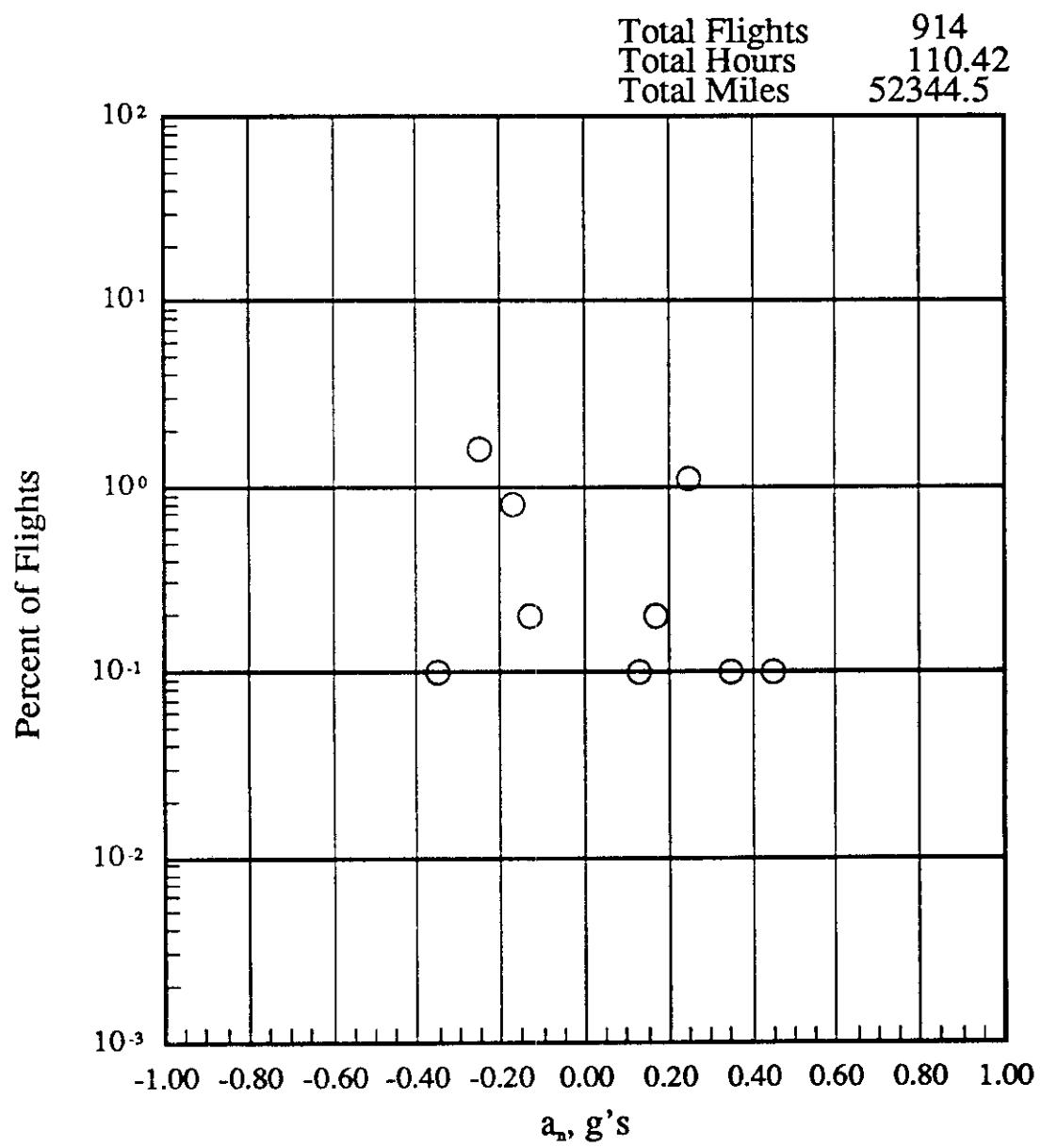
(e) 14500 to 19500 feet altitude

Figure 16.- Continued.



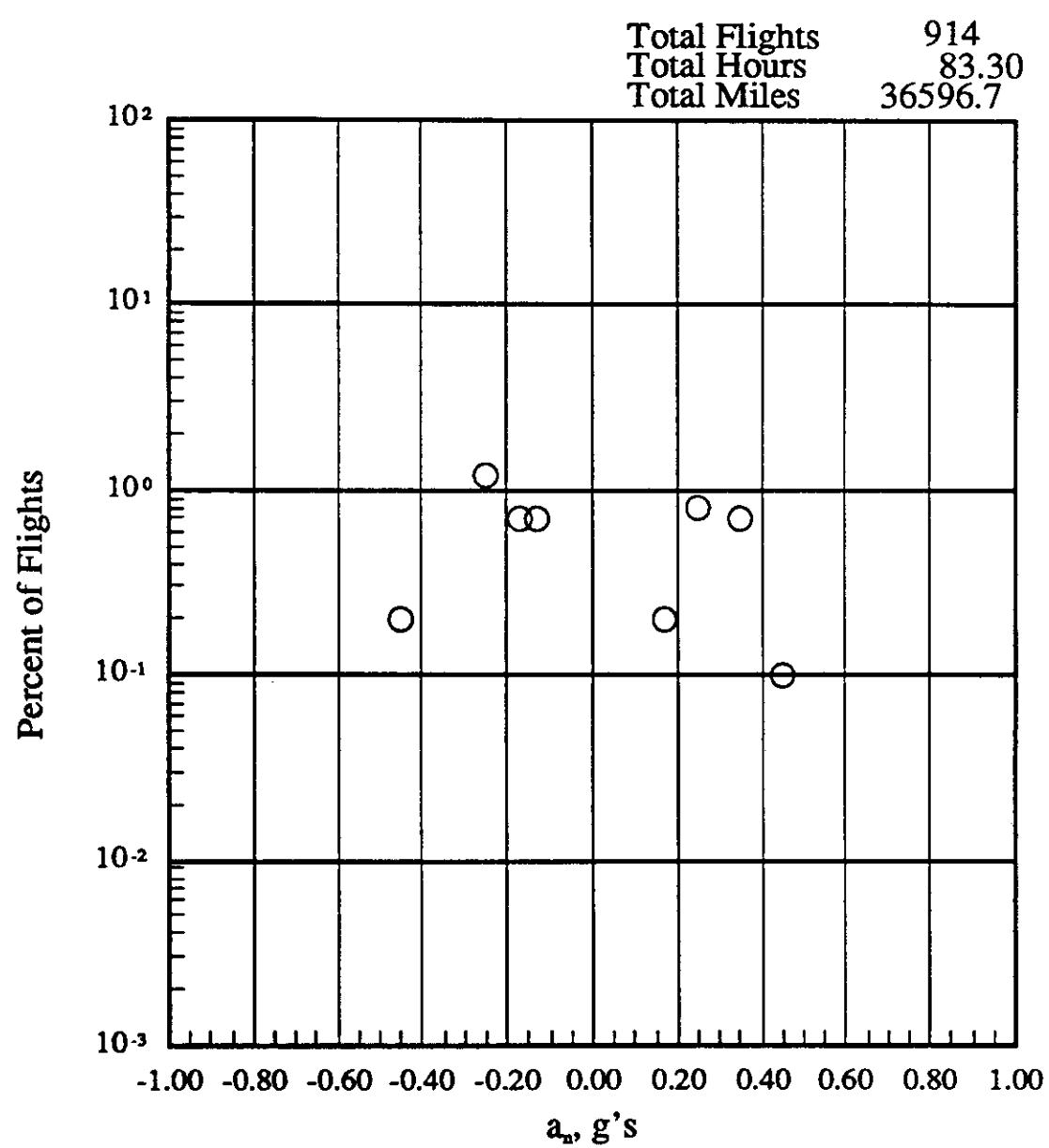
(d) 9500 to 14500 feet altitude

Figure 16.- Continued.



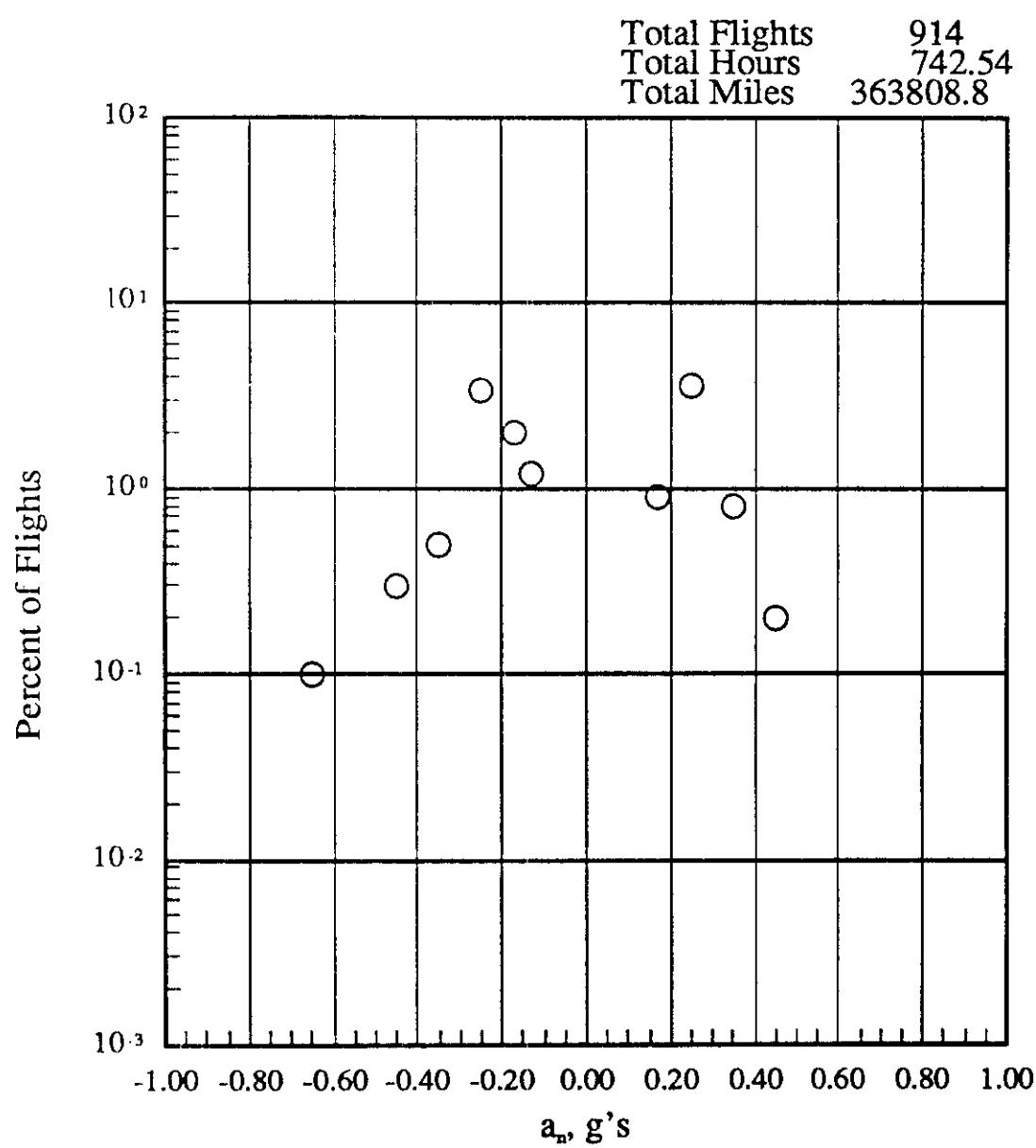
(g) 24500 to 29500 feet altitude

Figure 16.- Continued.



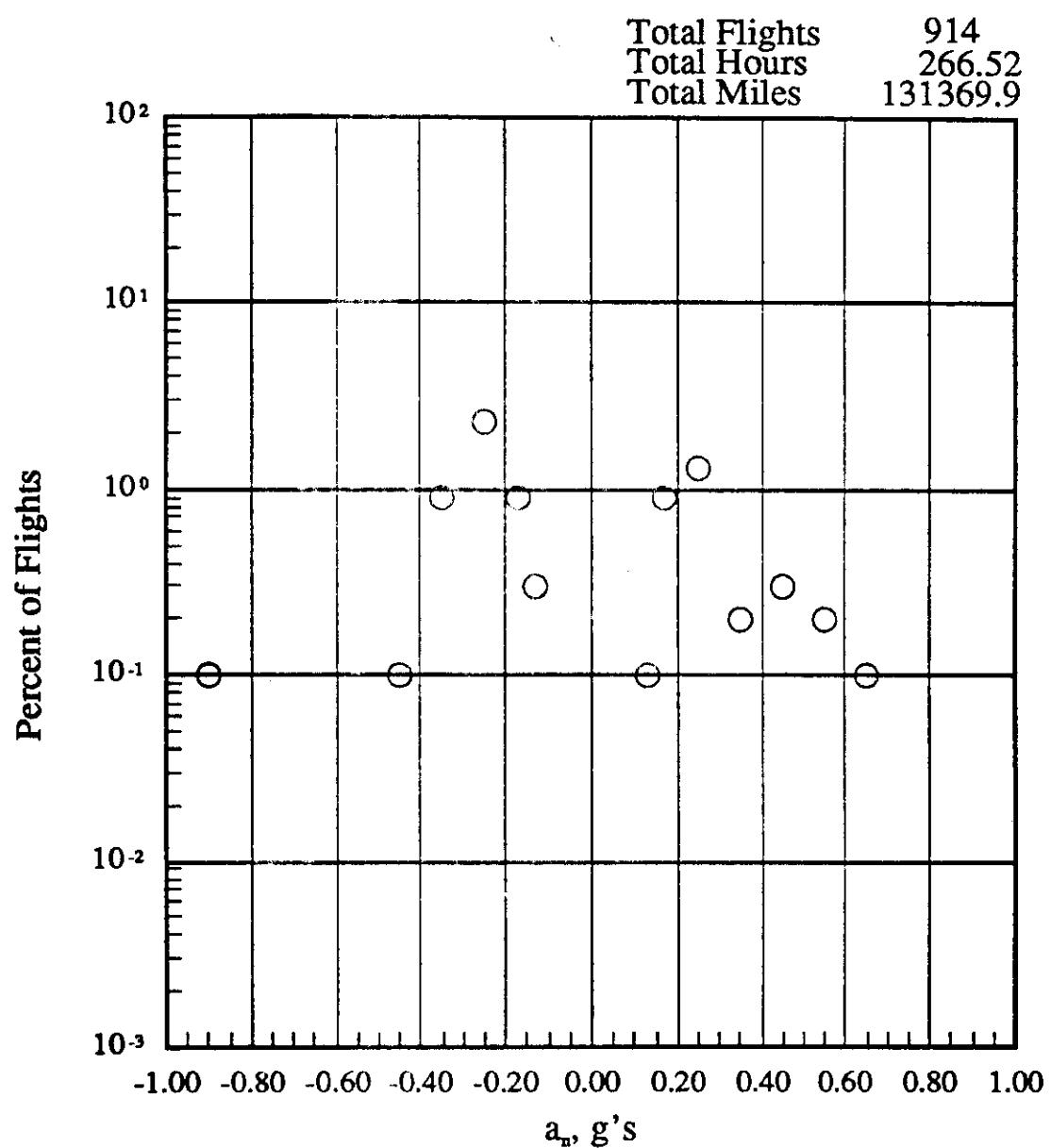
(f) 19500 to 24500 feet altitude

Figure 16.- Continued.



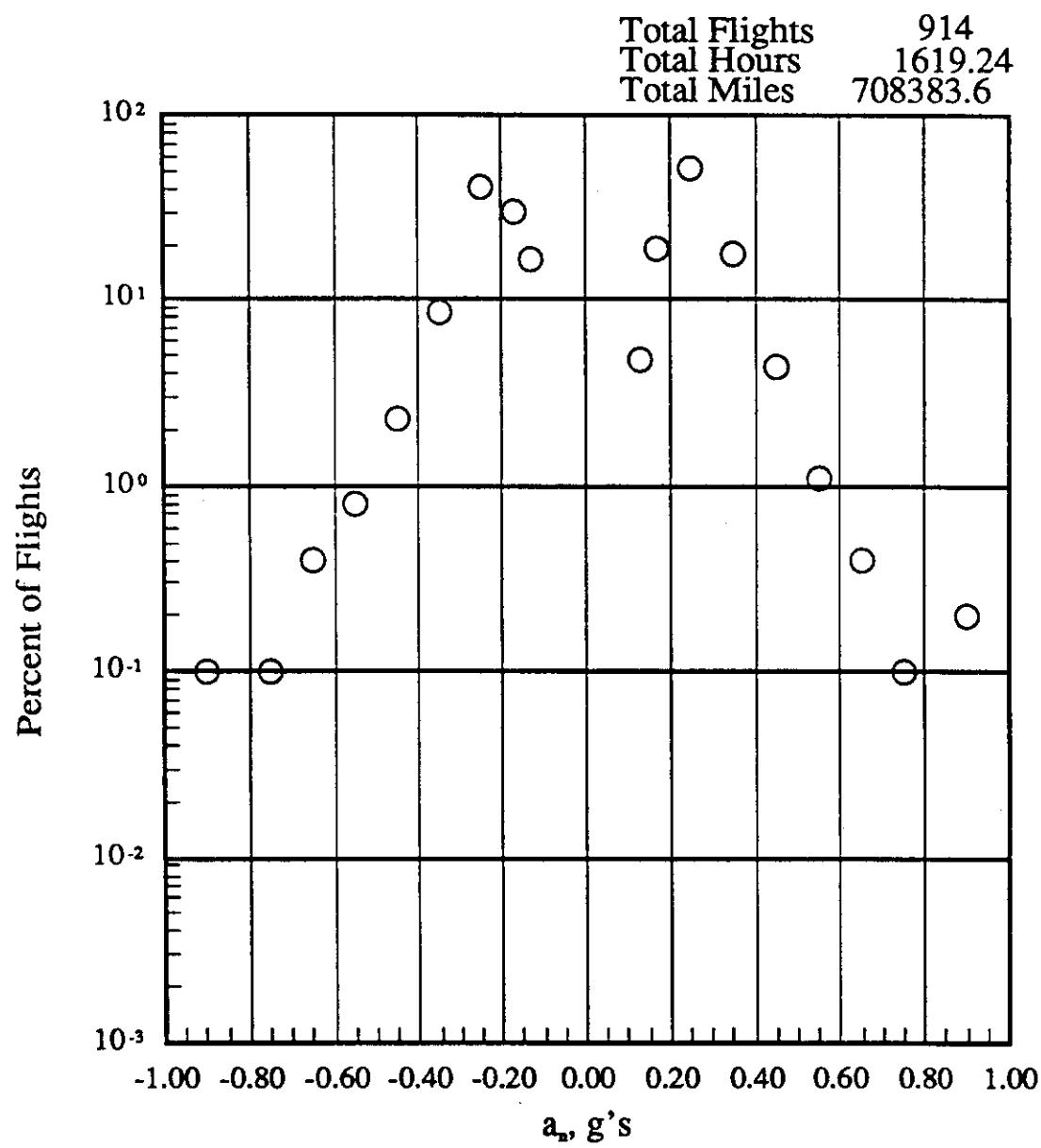
(i) 34500 to 39500 feet altitude

Figure 16.- Continued.



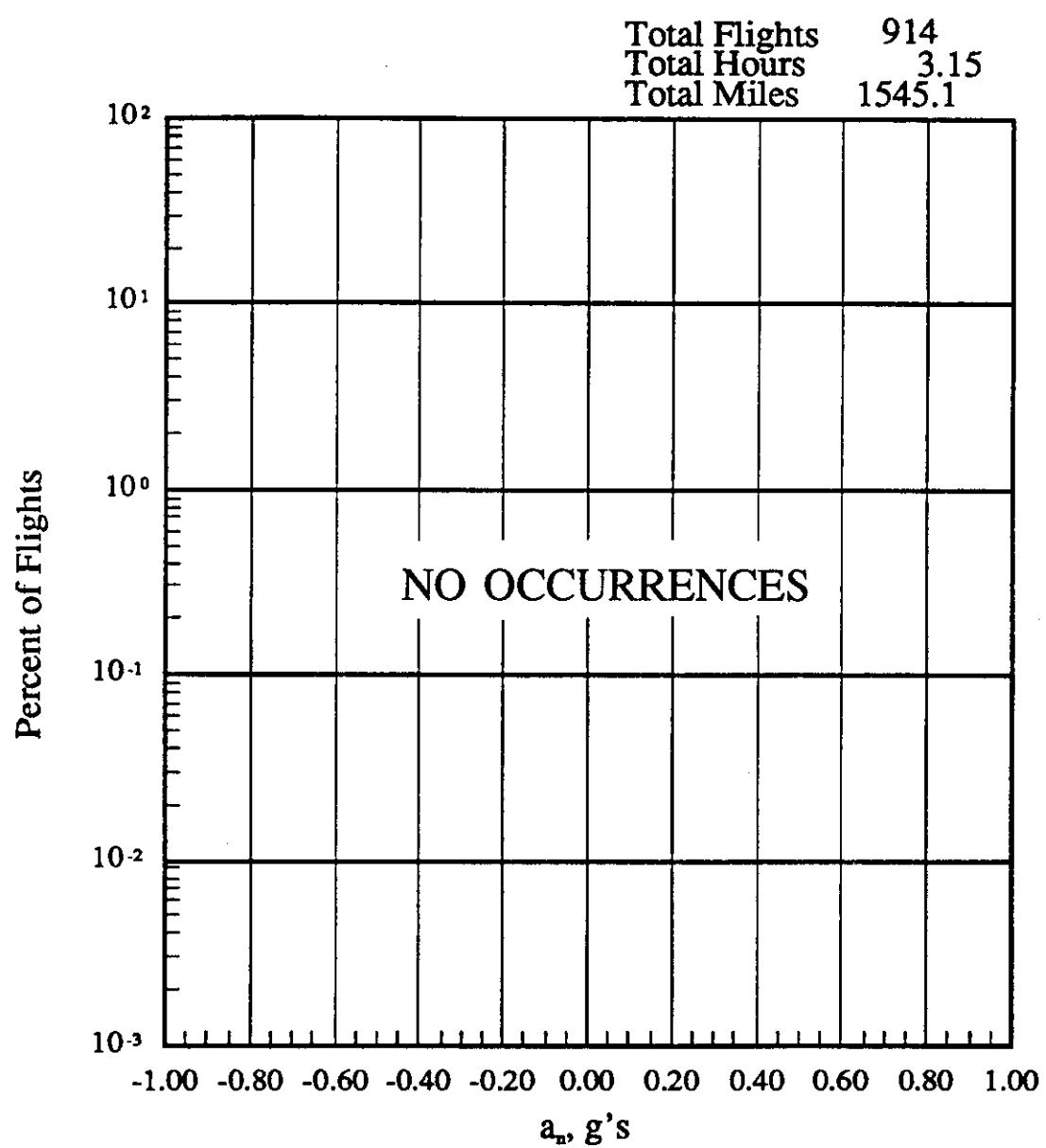
(h) 29500 to 34500 feet altitude

Figure 16.- Continued.



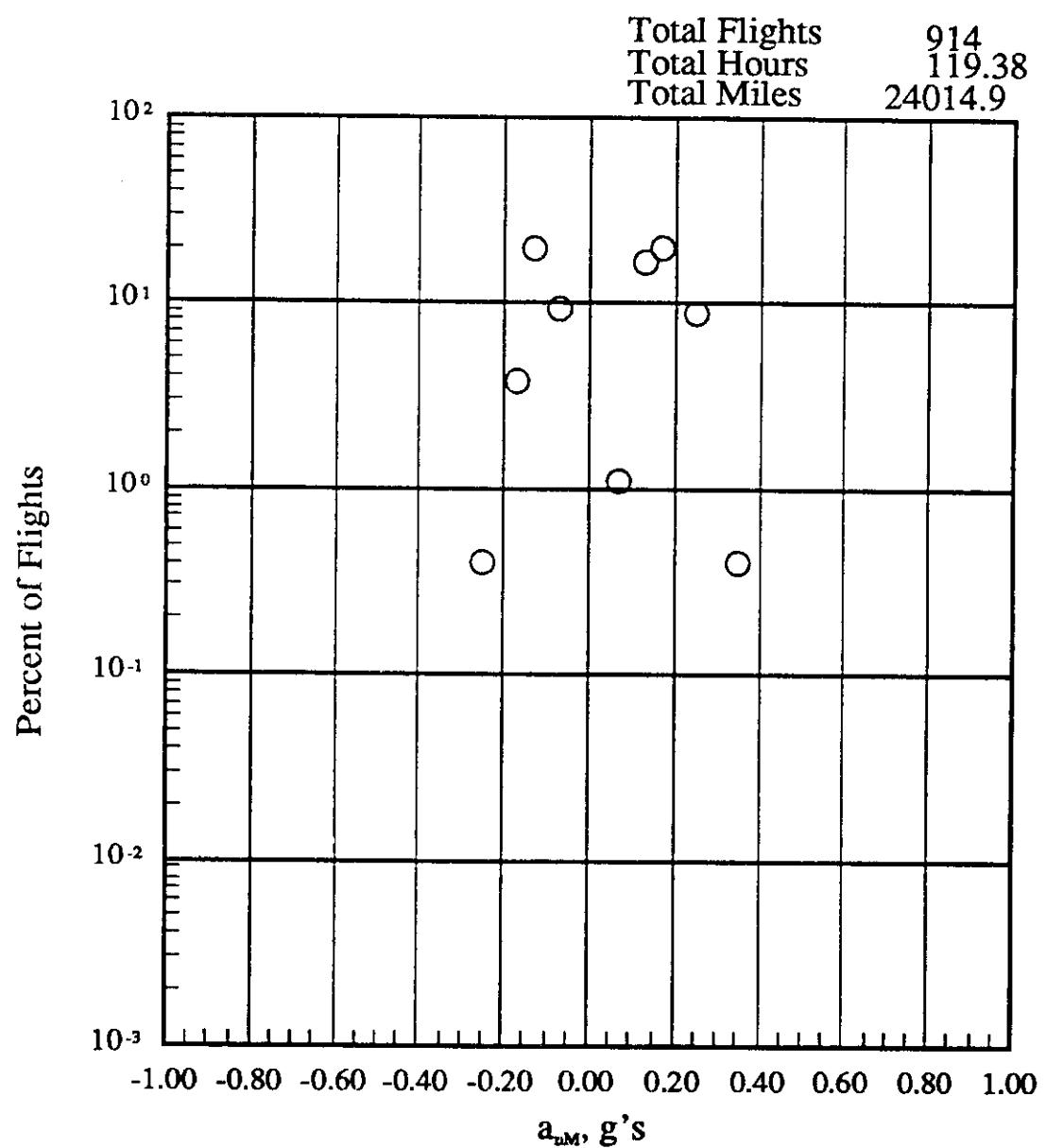
(k) -500 to 44500 feet altitude

Figure 16.- Concluded.



(j) 39500 to 44500 feet altitude

Figure 16.- Continued.



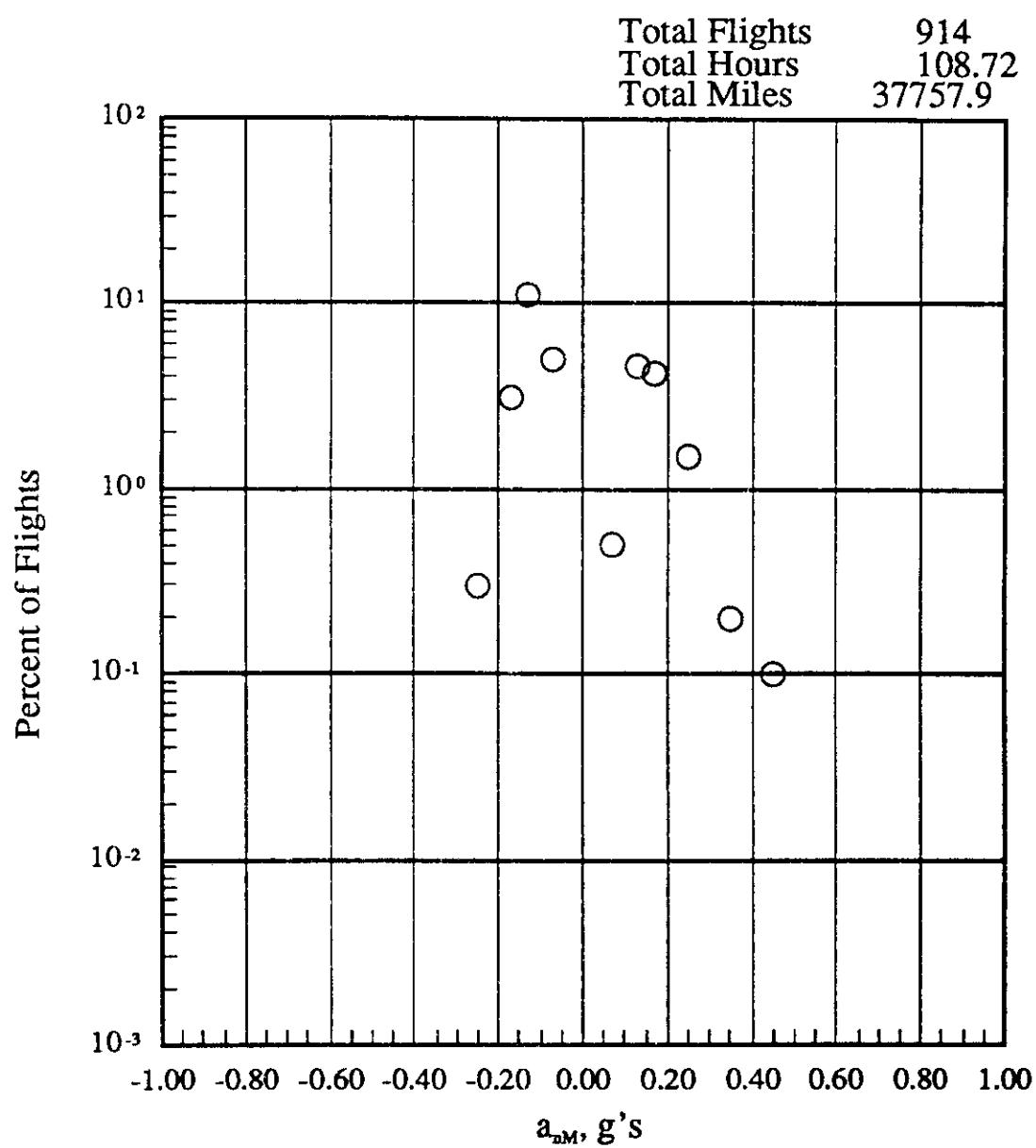
(b) -500 to 4500 feet altitude

Figure 17.- Continued.

MAXIMUM $a_{nM}$ LEVEL FOR EACH FLIGHT	-500 TO 4500 FT	PRESSURE ALTITUDE BANDS			-500 TO 44500 FT				
		-500 TO 9500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT
g's FROM TO									
1.60	1.80	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0
.70	.80	0	0	0	0	0	0	0	0
.60	.70	0	0	0	0	0	0	0	0
.50	.60	0	0	0	0	0	0	0	0
.40	.50	0	0	0.1	0	0	0	0	0.1
.30	.40	0.4	0.7	0.2	0.2	0.1	0	0.1	1.8
.20	.30	8.9	5.9	1.5	1.0	0.4	0.4	0.3	0.2
.15	.20	19.9	12.3	4.2	1.4	1.2	0.5	1.0	0.3
.10	.15	16.7	11.6	4.6	1.4	0.2	0.1	0.3	0.2
.05	.10	1.1	1.2	0.5	0.3	0	0.1	0.1	0
-.05	-.10	9.4	4.7	5.0	1.8	0.5	0.9	0.9	1.0
-.10	-.15	19.7	16.1	11.2	6.0	2.1	1.1	1.5	1.4
-.15	-.20	3.8	3.5	3.1	1.6	0.8	0.4	0.9	0.3
-.20	-.30	0.4	0.7	0.3	0.2	0.1	0.1	0.2	0.2
-.30	-.40	0	0	0	0	0	0	0	0
-.40	-.50	0	0	0	0	0	0	0	0
-.50	-.60	0	0	0	0	0	0	0	0
-.60	-.70	0	0	0	0	0	0	0	0
-.70	-.80	0	0	0	0	0	0	0	0
-.80	-.90	0	0	0	0	0	0	0	0
-.90	-.100	0	0	0	0	0	0	0	0
-.100	-.120	0	0	0	0	0	0	0	0
-.120	-.140	0	0	0	0	0	0	0	0
-.140	-.160	0	0	0	0	0	0	0	0
-.160	-.180	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14
TOTAL FLIGHTS									914.0

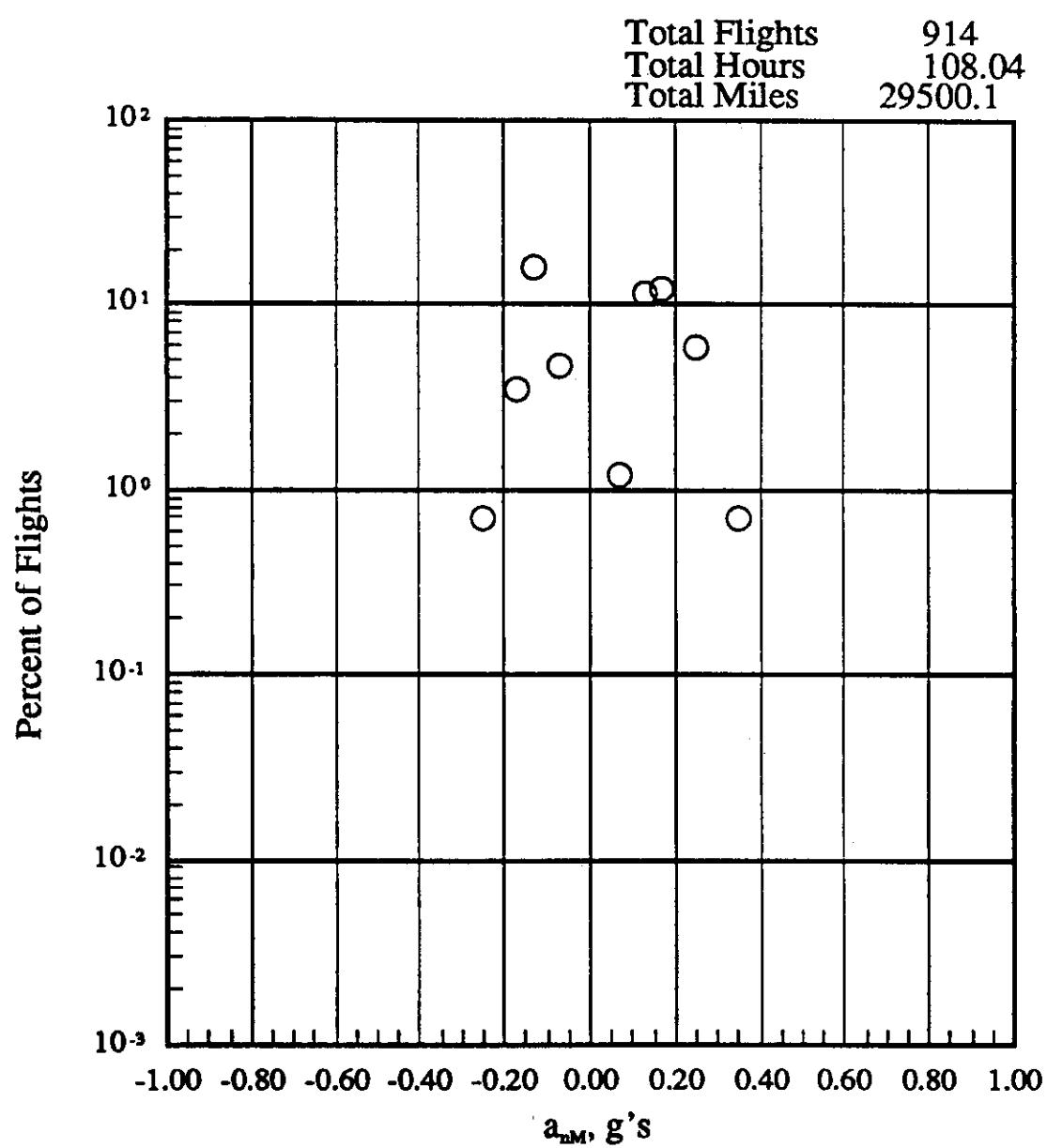
(a) Percent of flights where peak positive and negative  $a_{nM}$  per flight occurs within pressure altitude bands, any flap

Figure 17.- Peak Positive and negative  $a_{nM}$  vs. altitude.



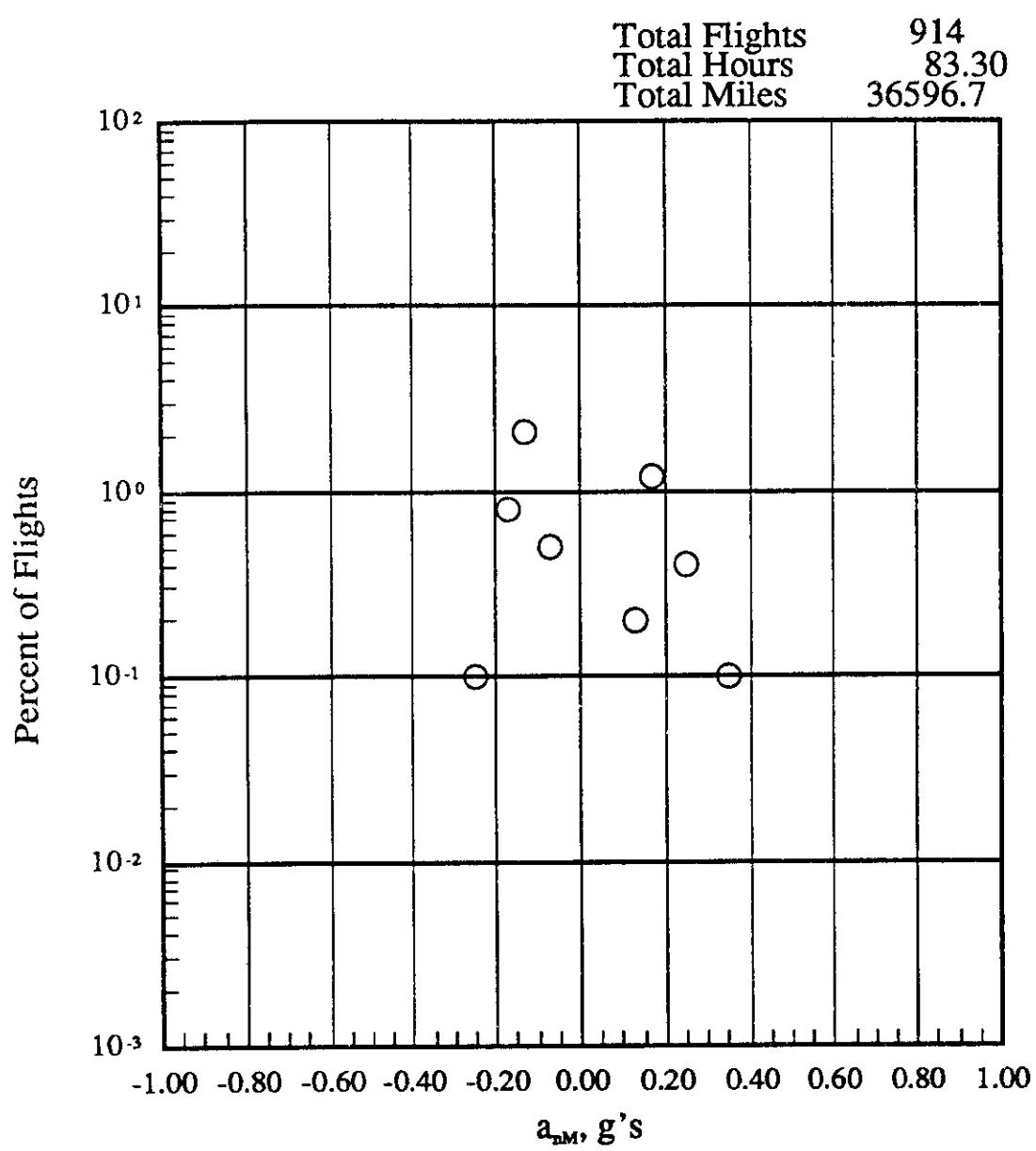
(d) 9500 to 14500 feet altitude

Figure 17.- Continued.



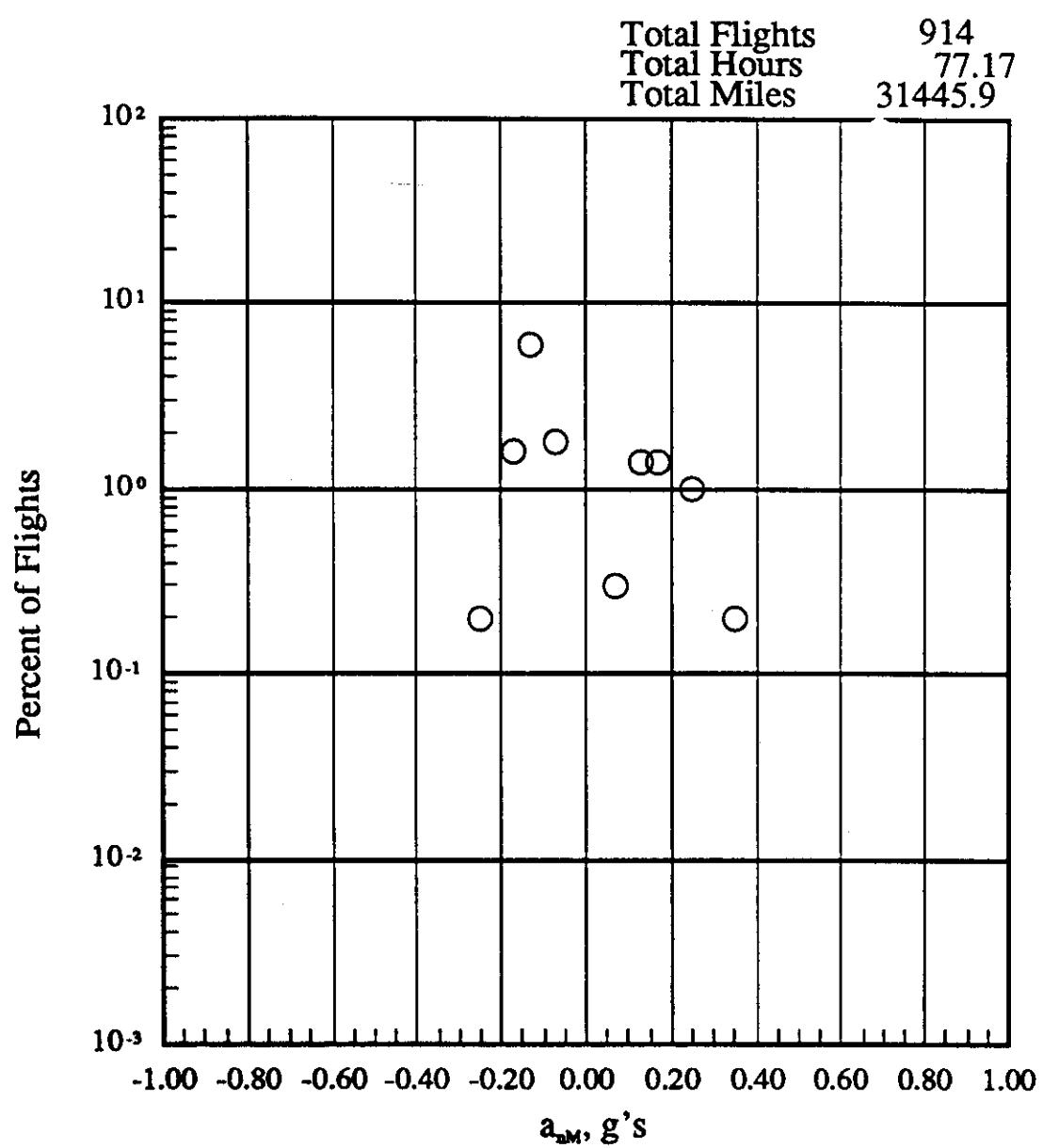
(c) 4500 to 9500 feet altitude

Figure 17.- Continued.



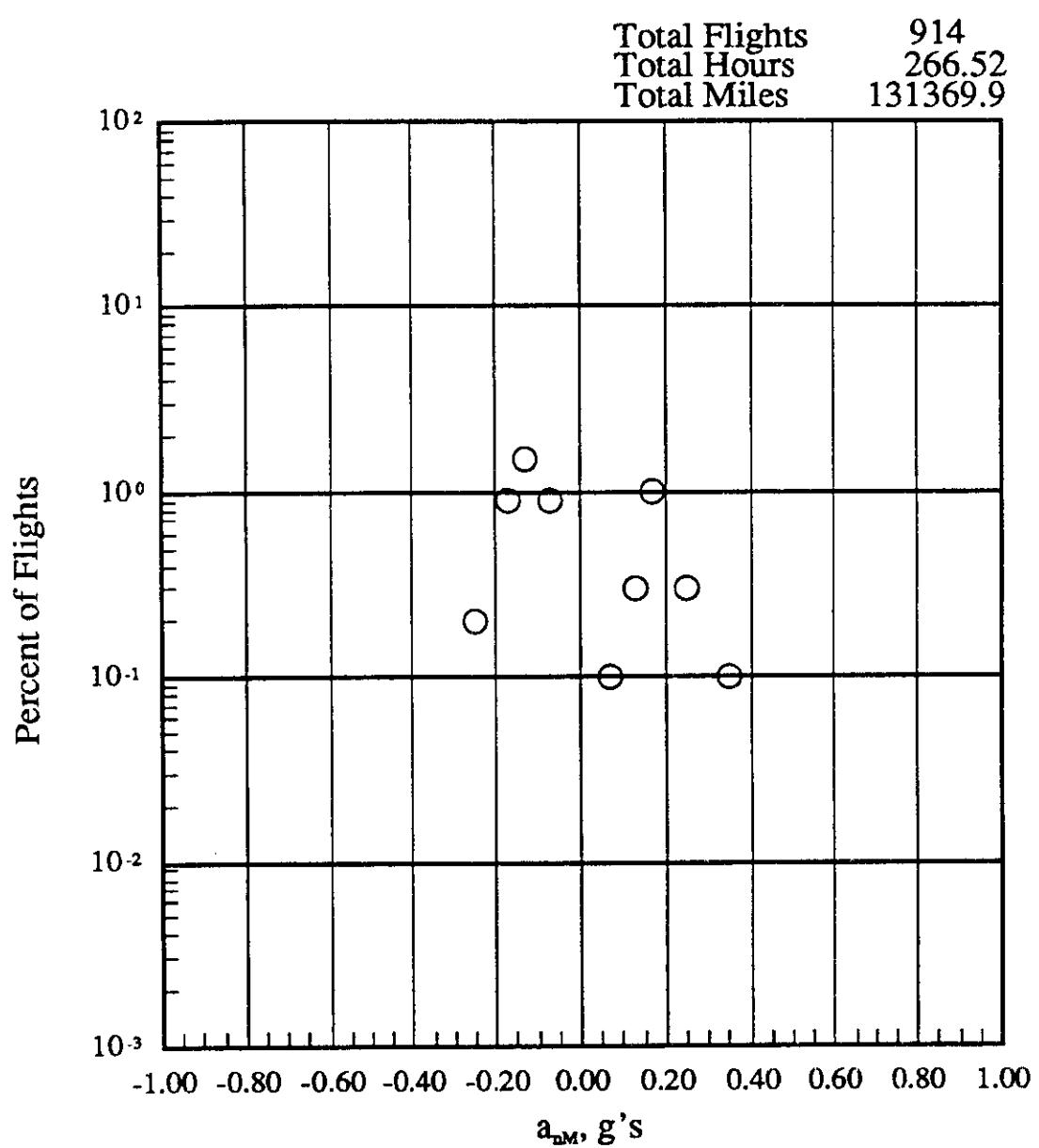
(f) 19500 to 24500 feet altitude

Figure 17.- Continued.



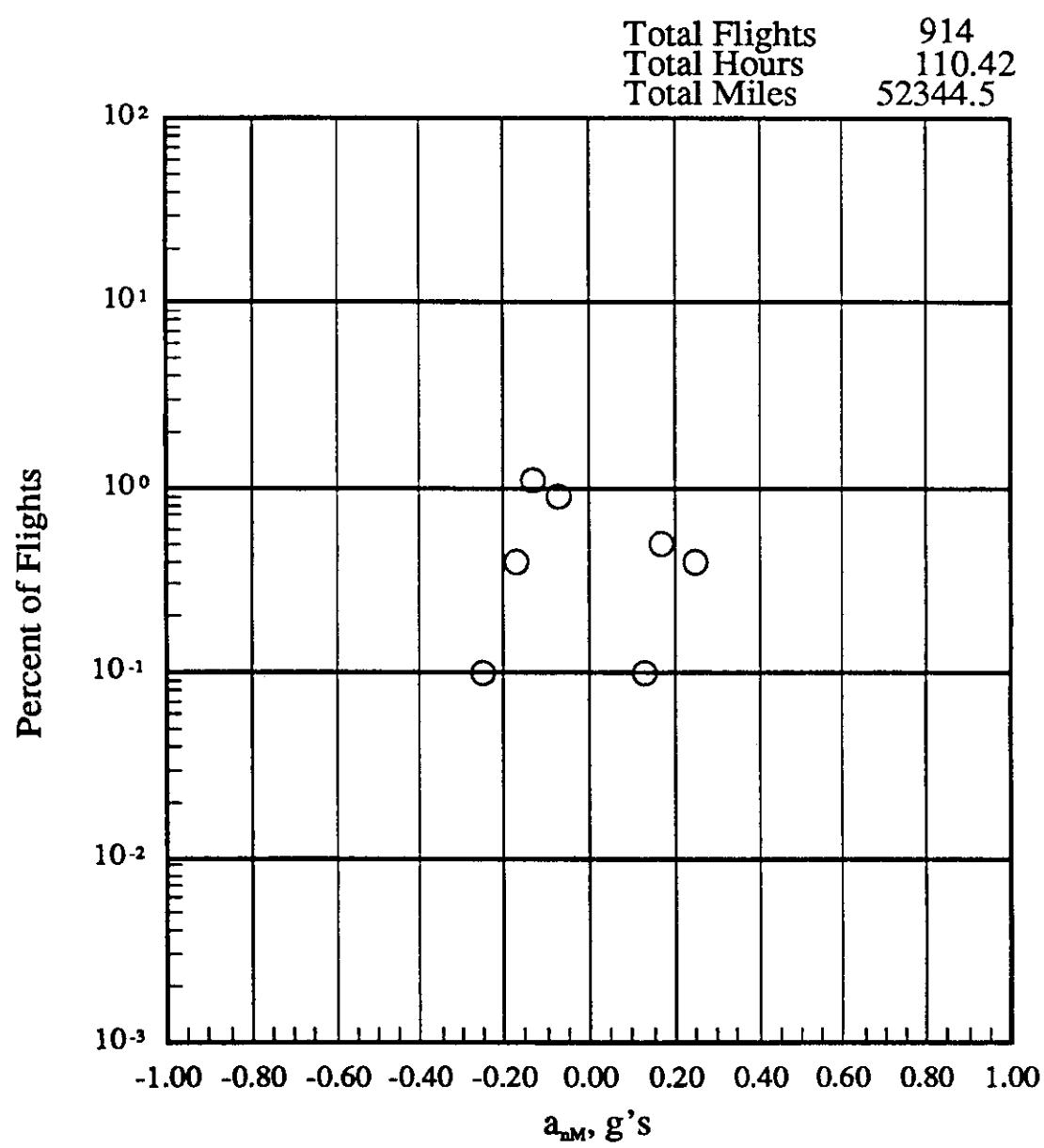
(e) 14500 to 19500 feet altitude

Figure 17.- Continued.



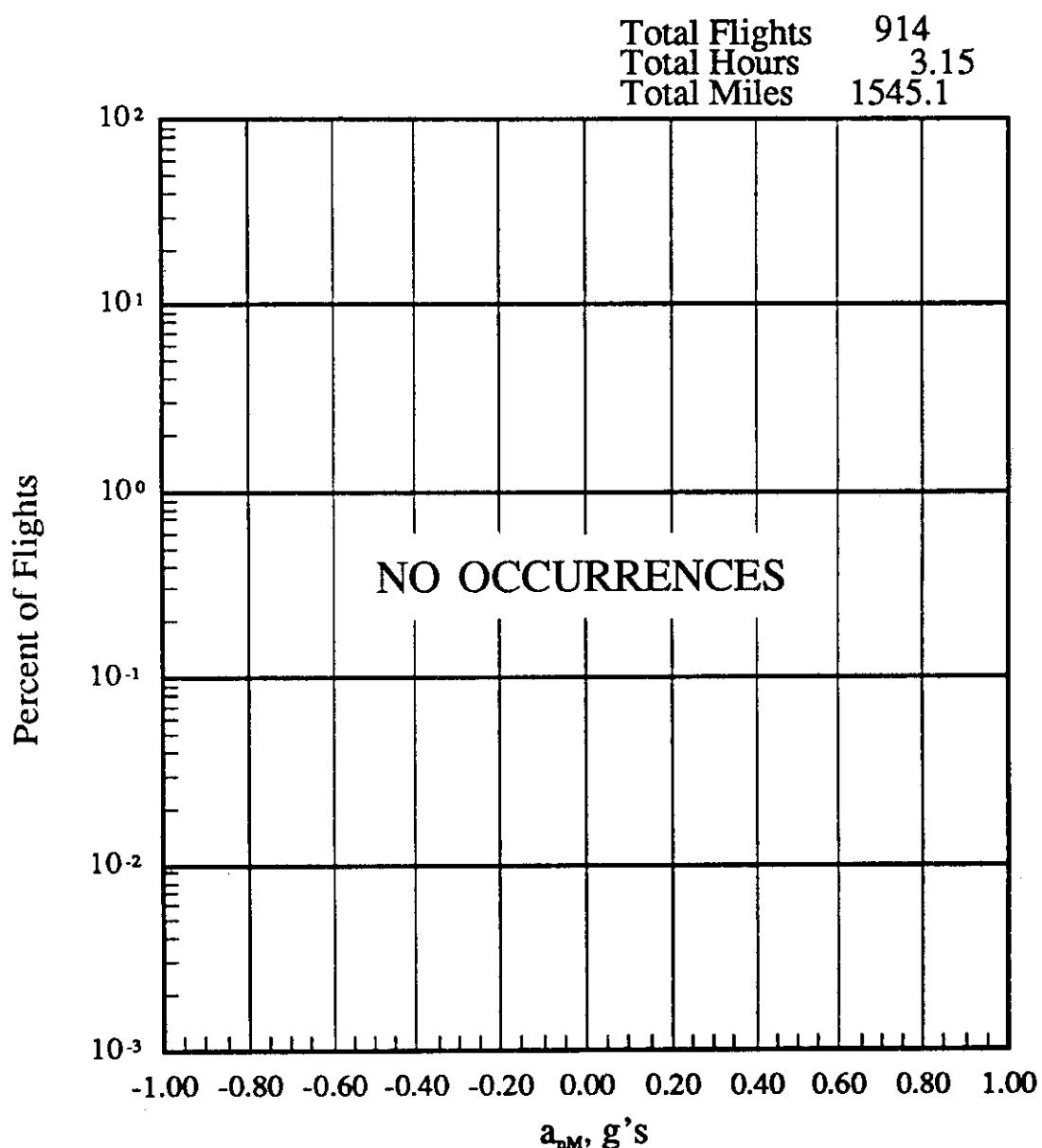
(h) 29500 to 34500 feet altitude

Figure 17.- Continued.



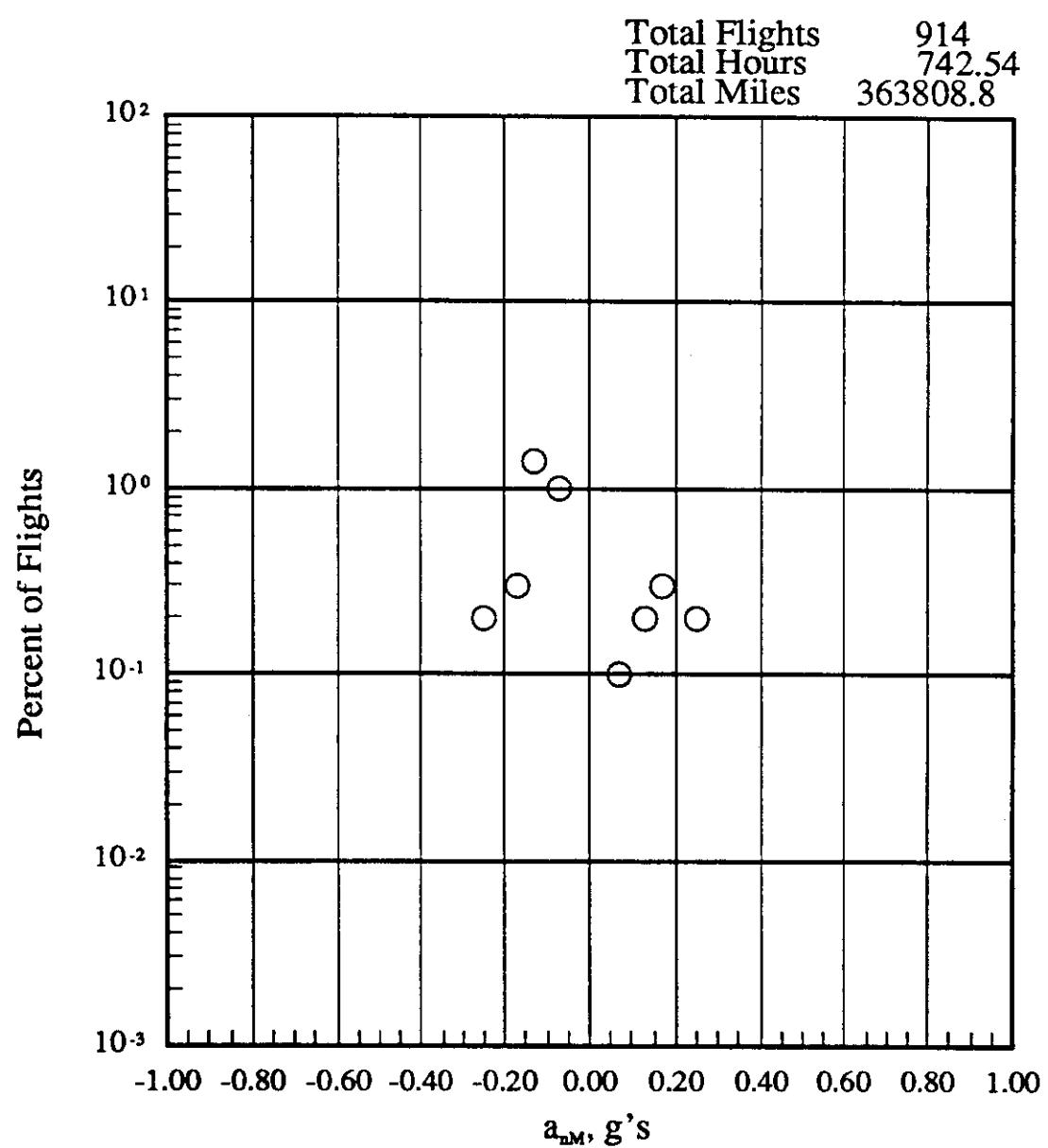
(g) 24500 to 29500 feet altitude

Figure 17.- Continued.



(j) 39500 to 44500 feet altitude

Figure 17.- Continued.



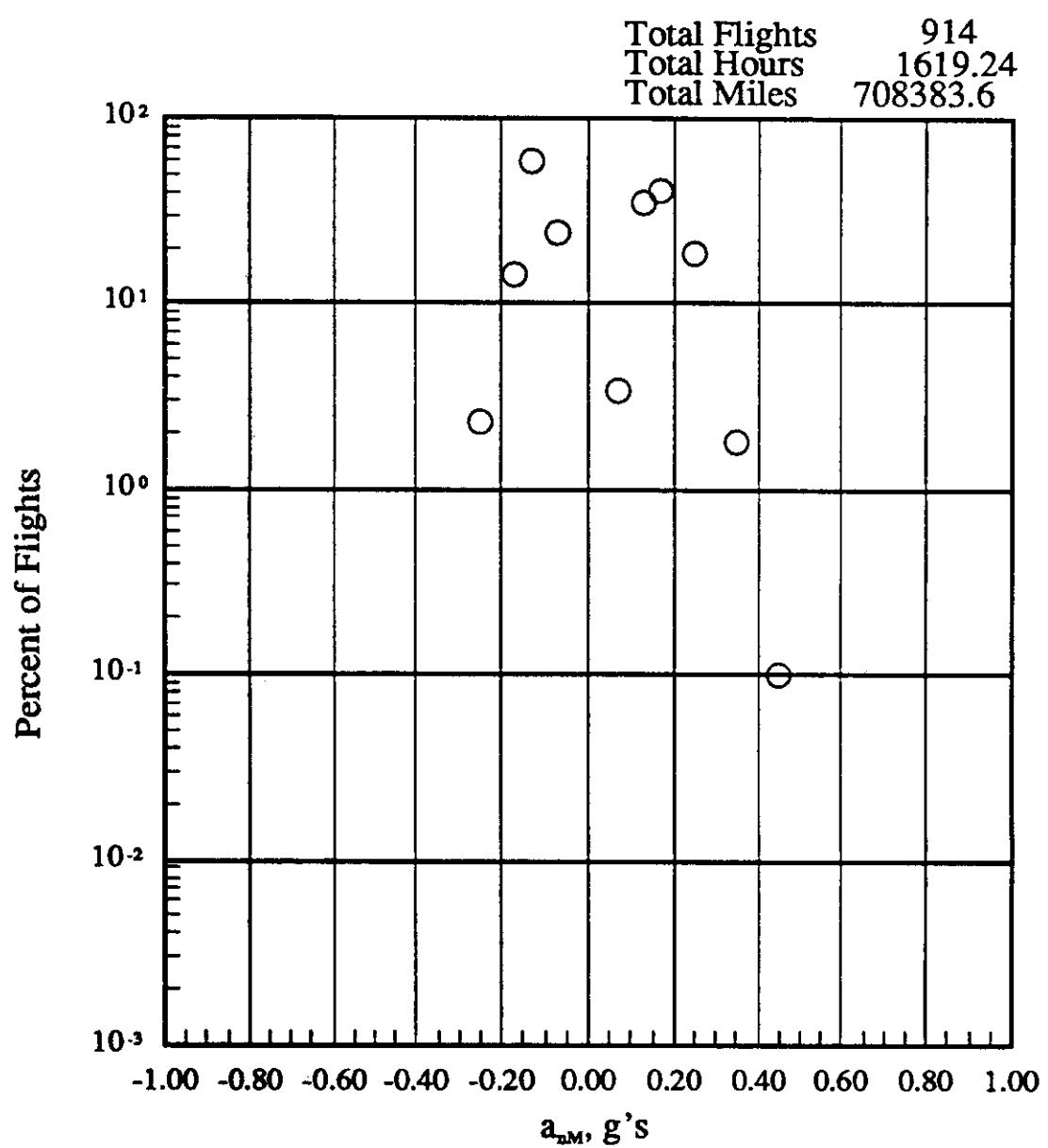
(i) 34500 to 39500 feet altitude

Figure 17.- Continued.

PRESSURE ALTITUDE BANDS										
MAXIMUM $\frac{dP}{dz}$ FOR EACH FLIGHT	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
G' FROM TO										
1.60	1.80	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0
.70	.80	0	0	0.1	0	0	0	0	0.1	0.1
.60	.70	0	0.2	0	0	0	0	0	0	0.2
.50	.60	0	0.3	0	0.2	0	0	0	0	0.5
.40	.50	0	0.4	0.7	0	0.1	0	0.1	0	1.3
.30	.40	1.1	0.9	1.5	0.4	0	0.1	0.8	0.3	5.1
.20	.30	9.4	4.5	3.3	1.6	0.8	0.5	0.8	2.6	23.5
.15	.20	15.0	4.0	2.6	1.0	0.7	0.9	2.1	3.8	30.1
.10	.15	17.3	4.0	2.3	0.7	1.4	0.7	1.6	1.6	29.6
.05	.10	5.3	1.3	0.9	0.5	0.3	0.2	0.5	0.3	9.4
- .05	- .10	5.3	1.9	0.5	0.4	0.2	0.1	0.5	0.8	9.7
- .10	- .15	15.9	4.5	2.3	1.1	0.9	0.7	1.6	2.5	29.4
- .10	- .20	14.7	3.5	2.7	1.4	0.9	0.5	1.3	3.3	28.3
- .20	- .30	10.6	4.6	4.4	1.1	0.2	0.8	1.2	2.2	25.1
- .30	- .40	1.1	1.3	1.0	0.5	0	0	0.4	0.5	5.0
- .40	- .50	0.3	0.8	0.2	0.1	0	0	0.1	0	1.5
- .50	- .60	0	0.3	0.2	0	0	0	0	0	0.5
- .60	- .70	0	0	0.1	0	0	0	0	0	0.1
- .70	- .80	0	0	0	0	0	0	0.1	0	0.1
- .80	- .90	0	0.1	0	0	0	0	0	0	0.1
- .90	-1.00	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	119.38	108.04	108.72	77.17	83.30	110.42	266.52	742.54	3.15	1619.24
FLIGHT MILES @ ALT	24014.89	29500.10	37757.94	31445.86	36596.71	52344.52	131369.93	363808.56	1545.14	70883.64

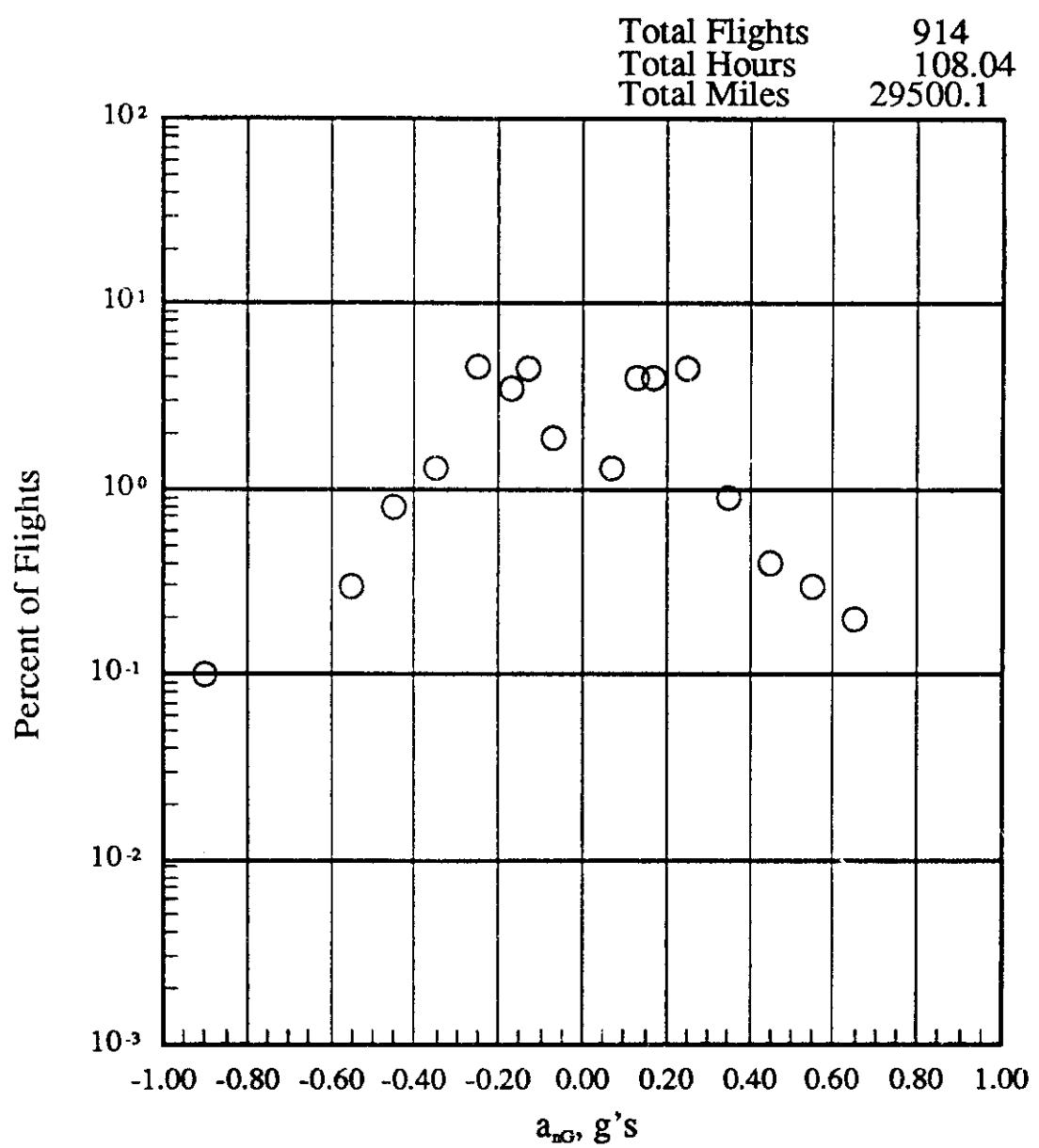
(a)  $a_{nG}$  Percent of flights where peak positive and negative  $a_{nG}$  per flight occurs within pressure altitude bands, any flap

Figure 18.- Peak positive and negative  $a_nG$  vs altitude.



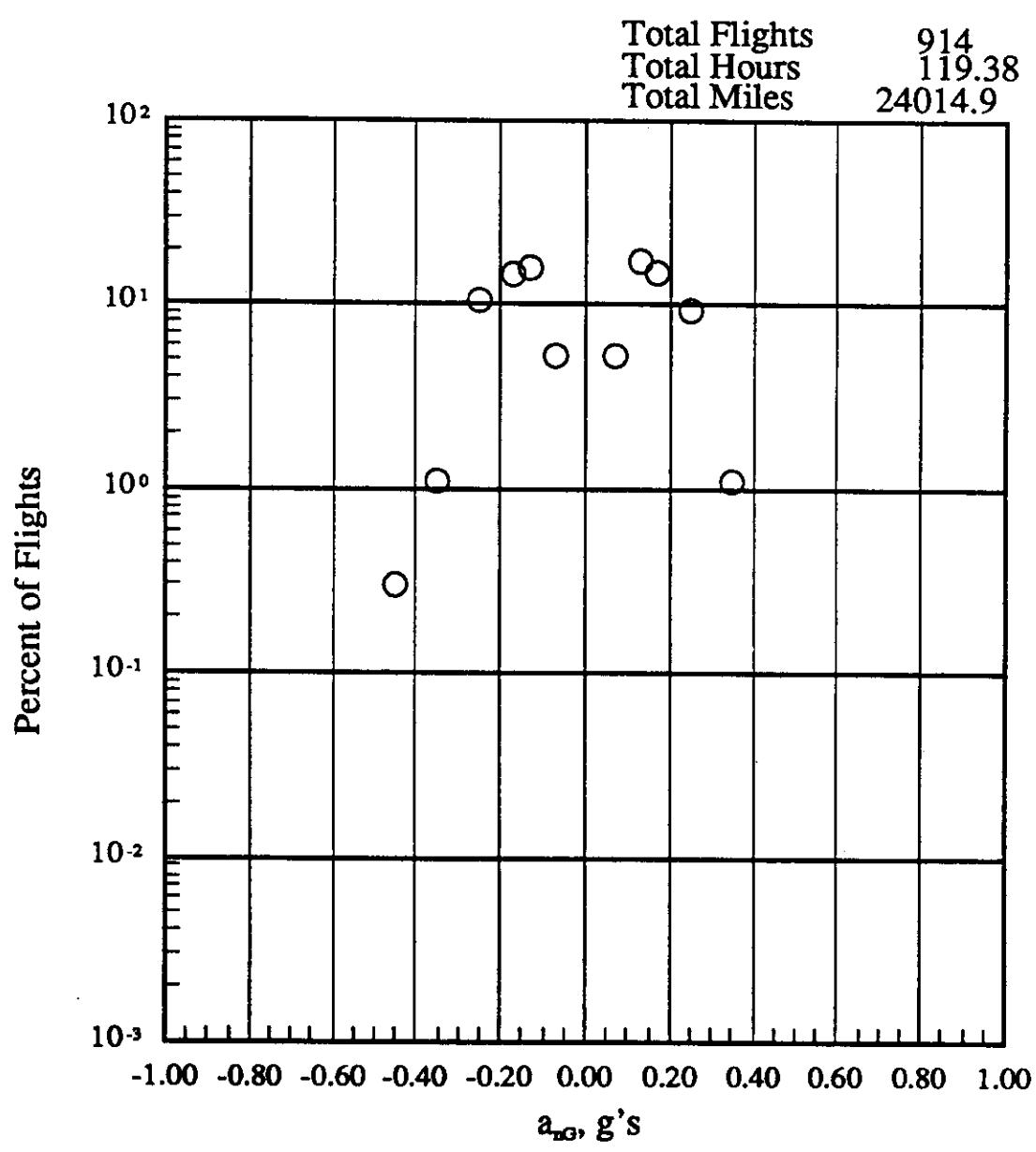
(k) -500 to 44500 feet altitude

Figure 17.- Concluded.



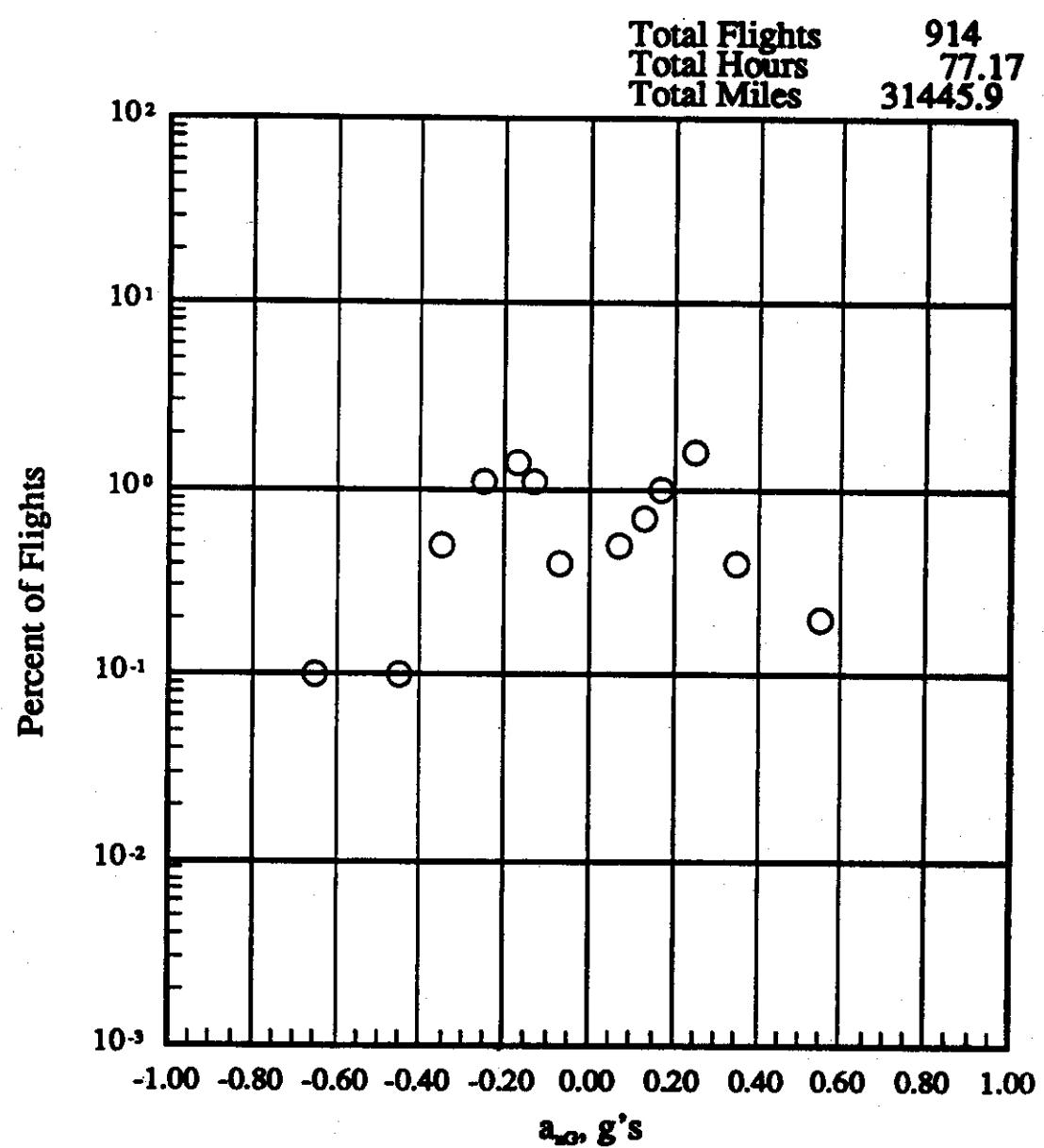
(c) 4500 to 9500 feet altitude

Figure 18.- Continued.



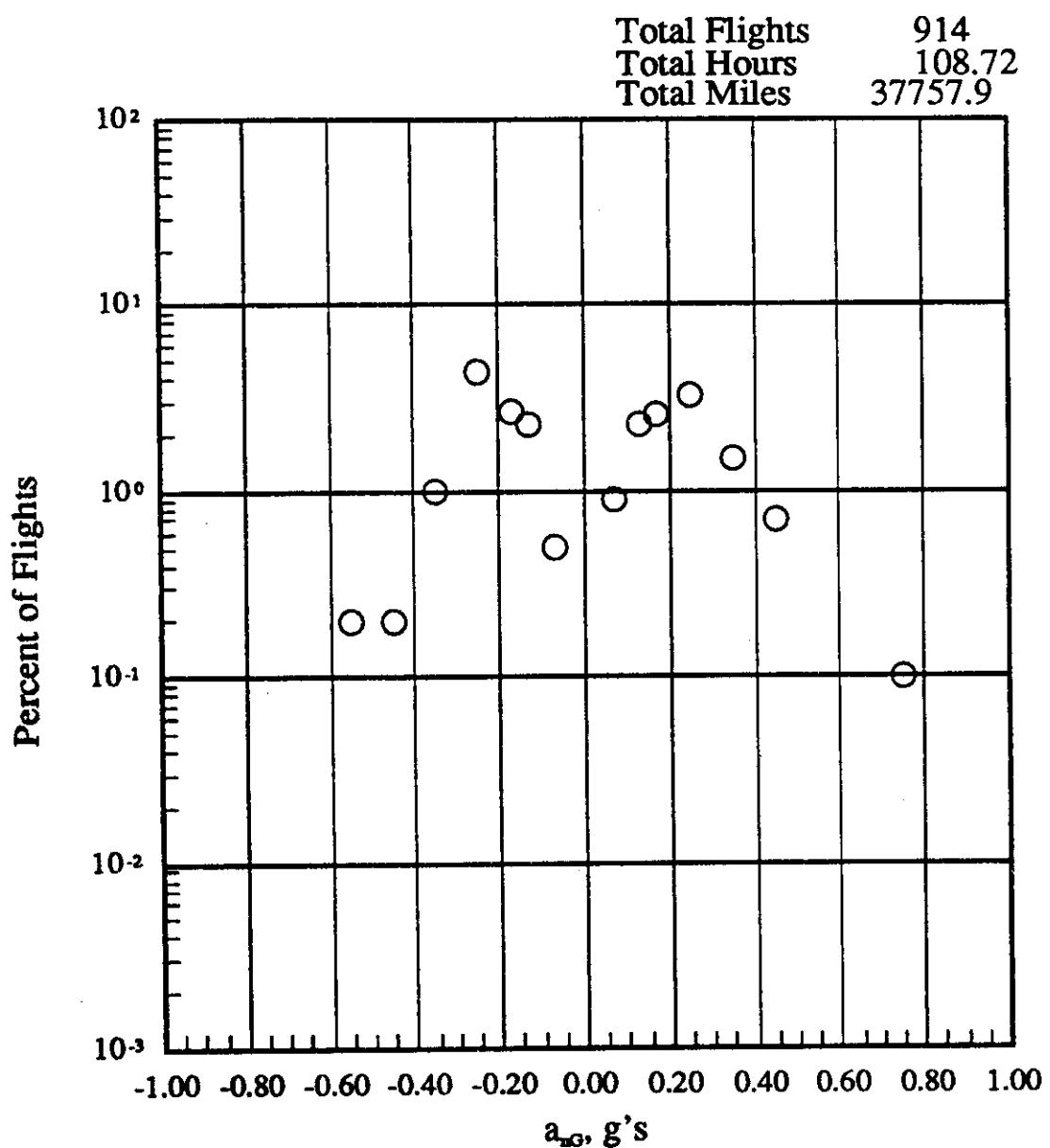
(b) -500 to 4500 feet altitude

**Figure 18.- Continued.**



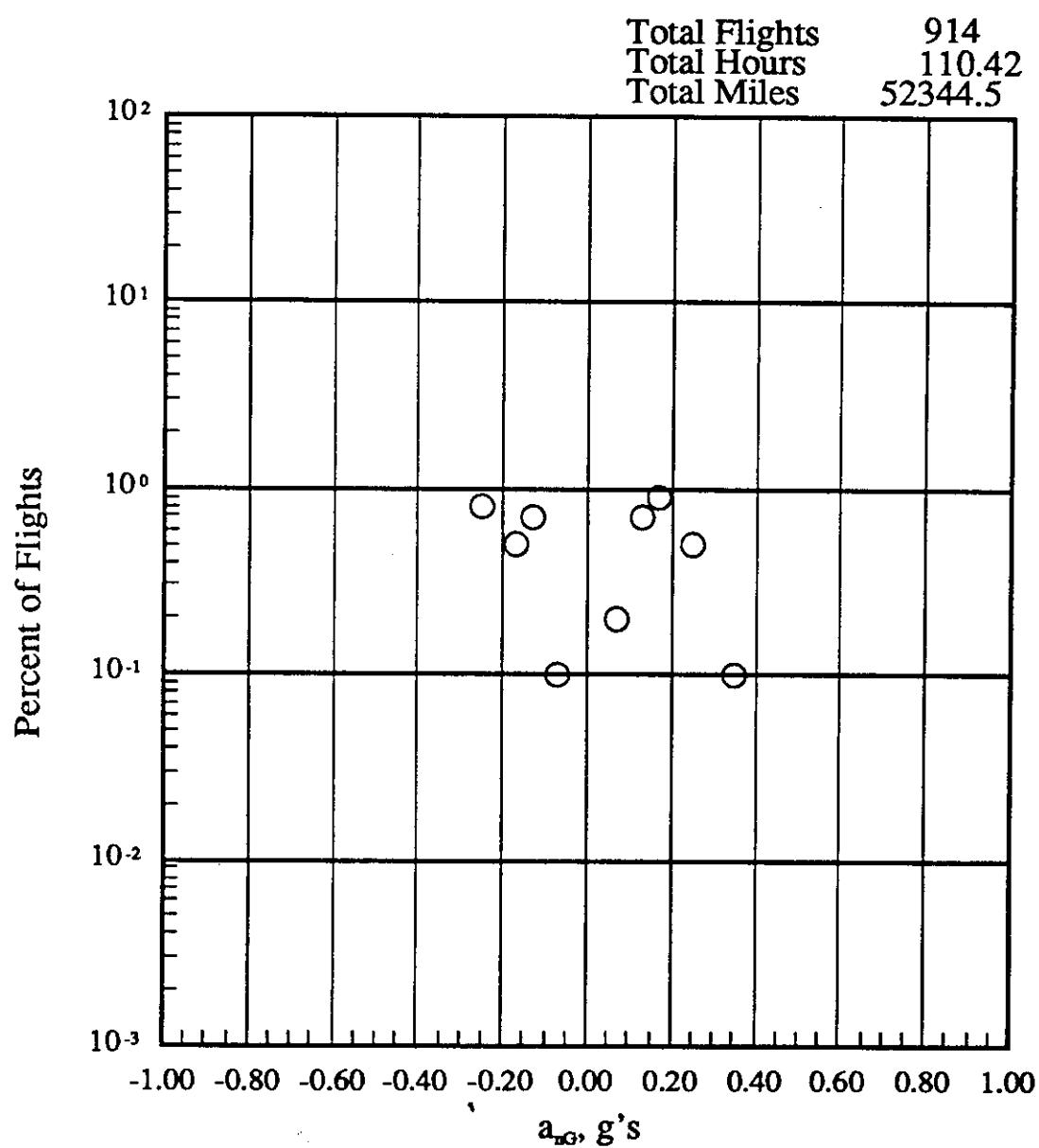
(e) 14500 to 19500 feet altitude

Figure 18.- Continued.



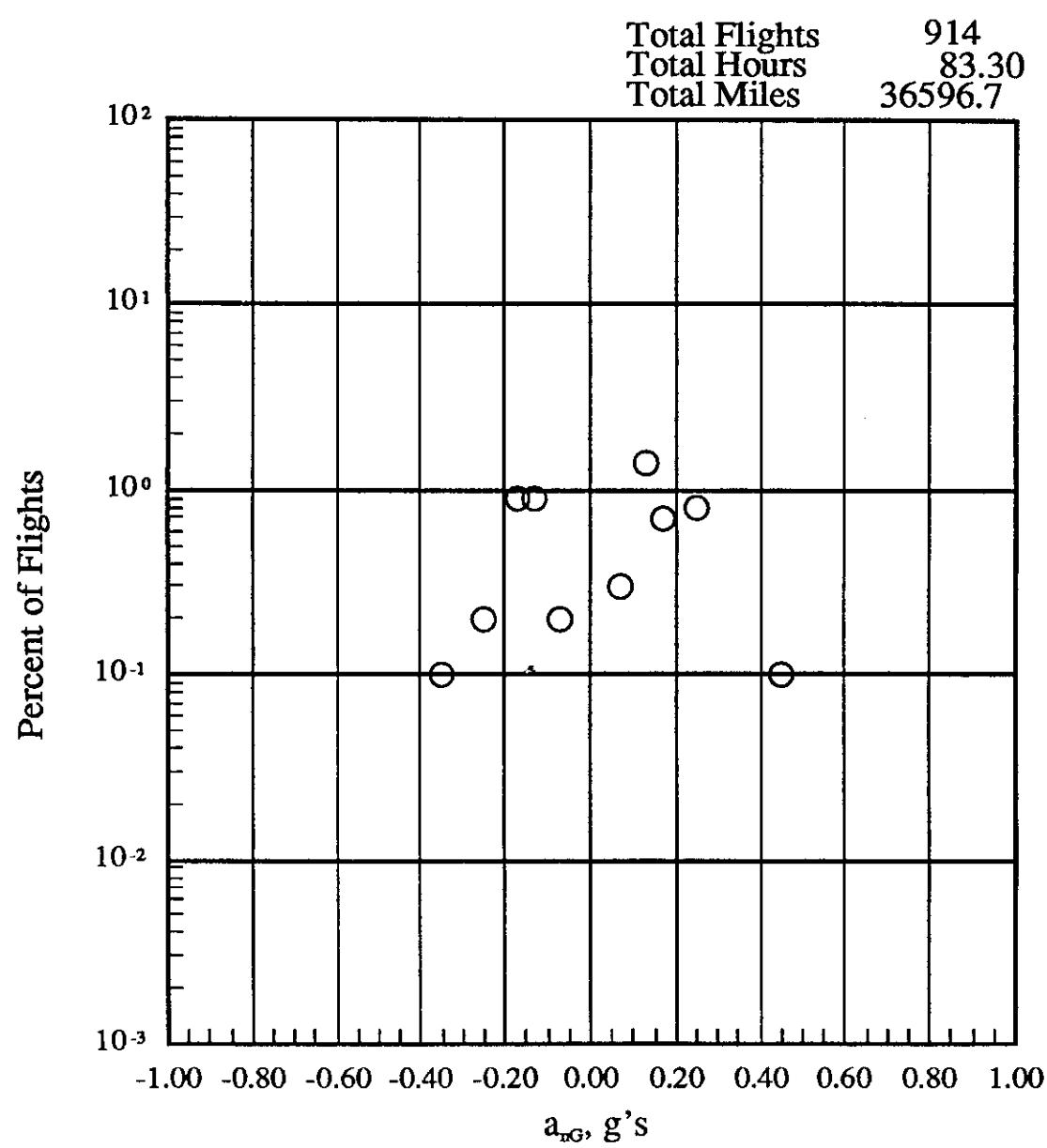
(d) 9500 to 14500 feet altitude

Figure 18.- Continued.



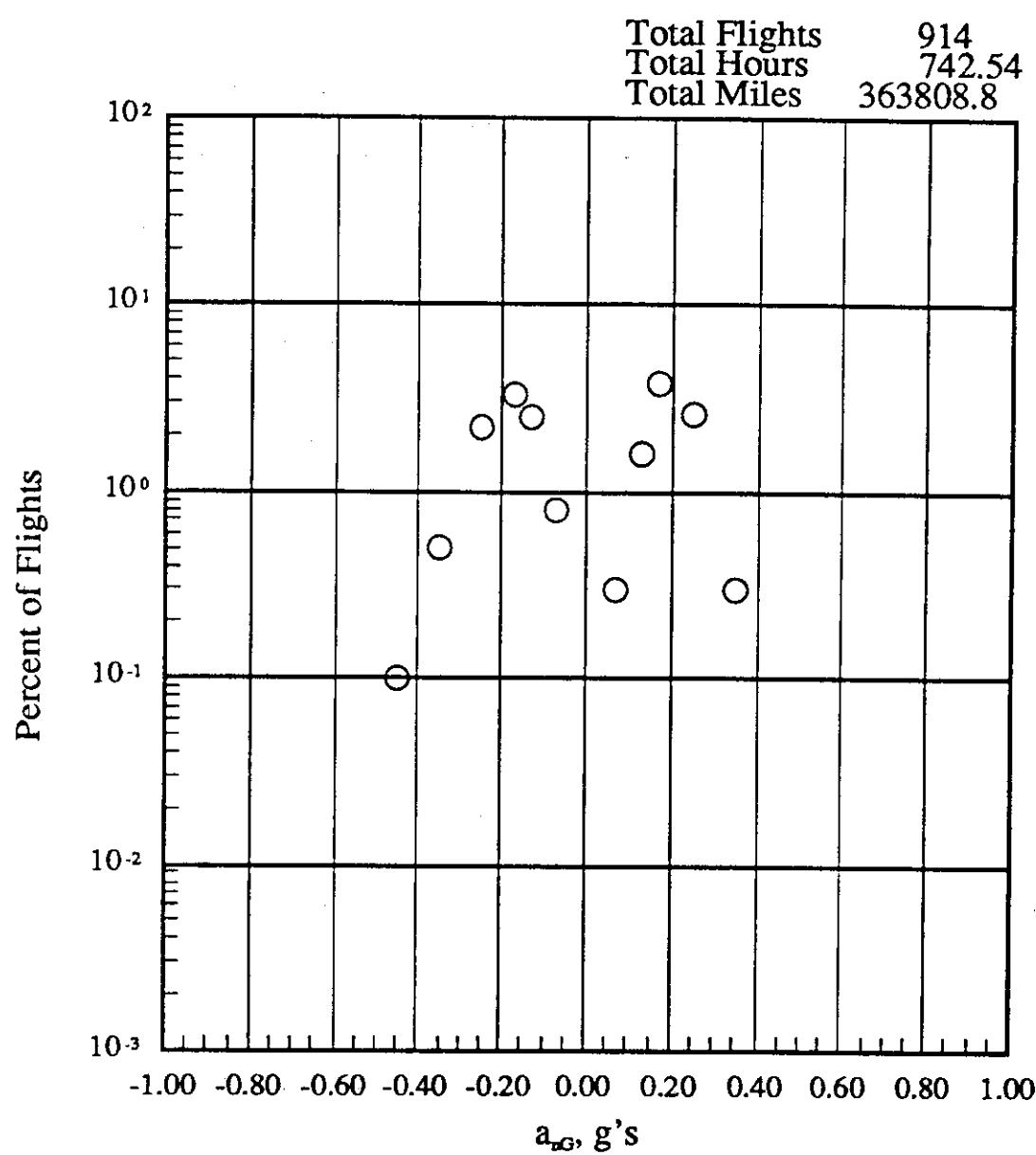
(g) 24500 to 29500 feet altitude

Figure 18.- Continued.



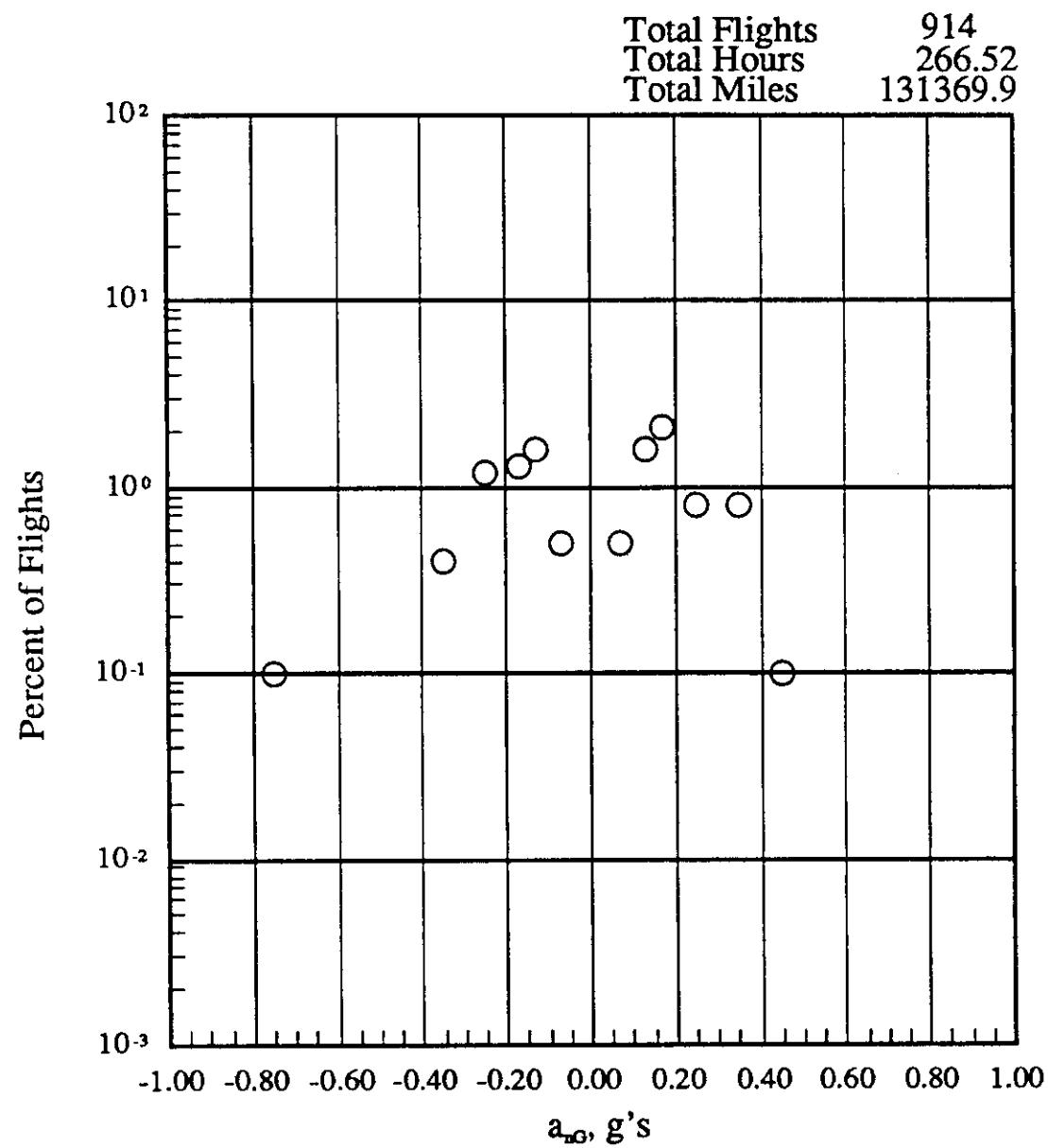
(f) 19500 to 24500 feet altitude

Figure 18.- Continued.



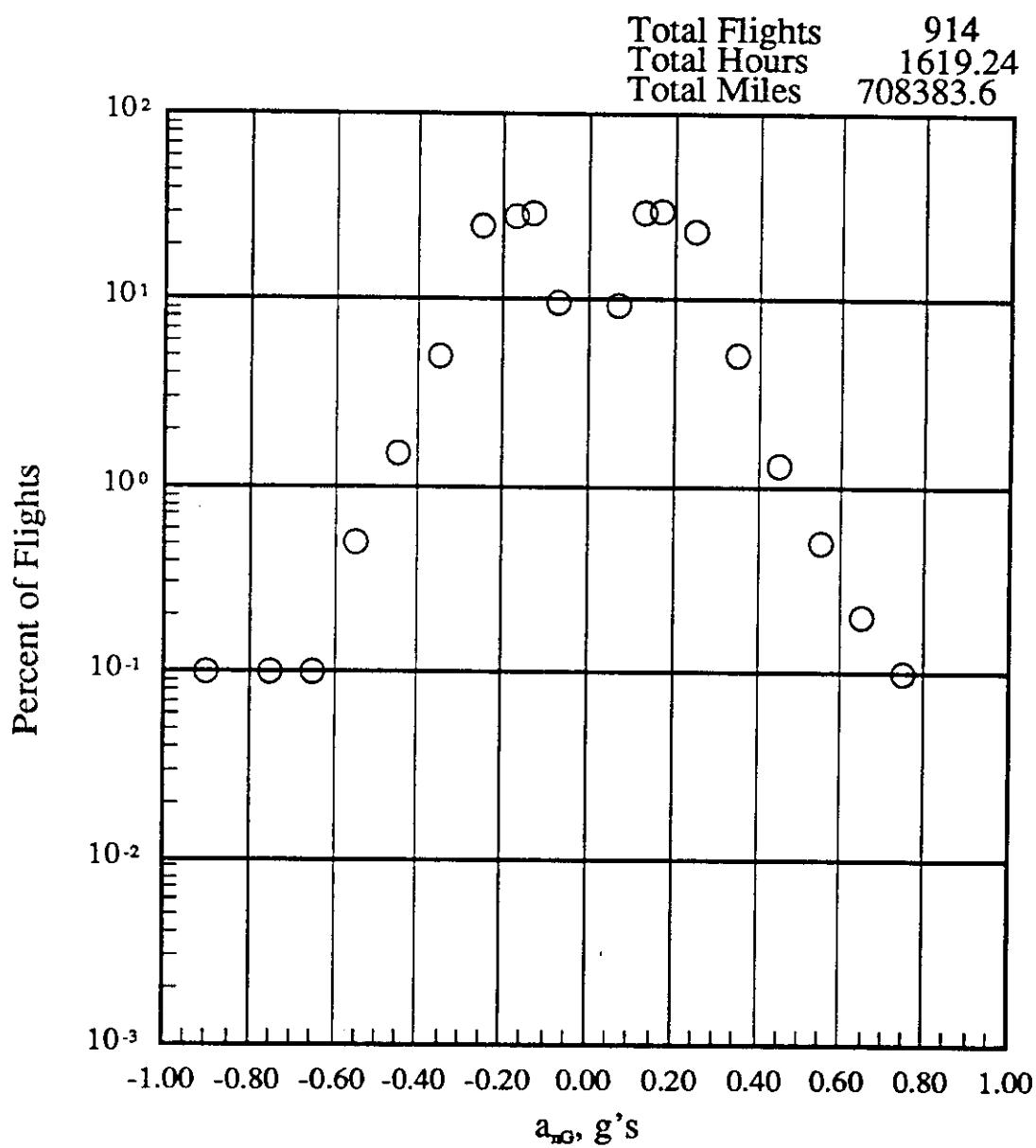
(i) 34500 to 39500 feet altitude

Figure 18.- Continued.



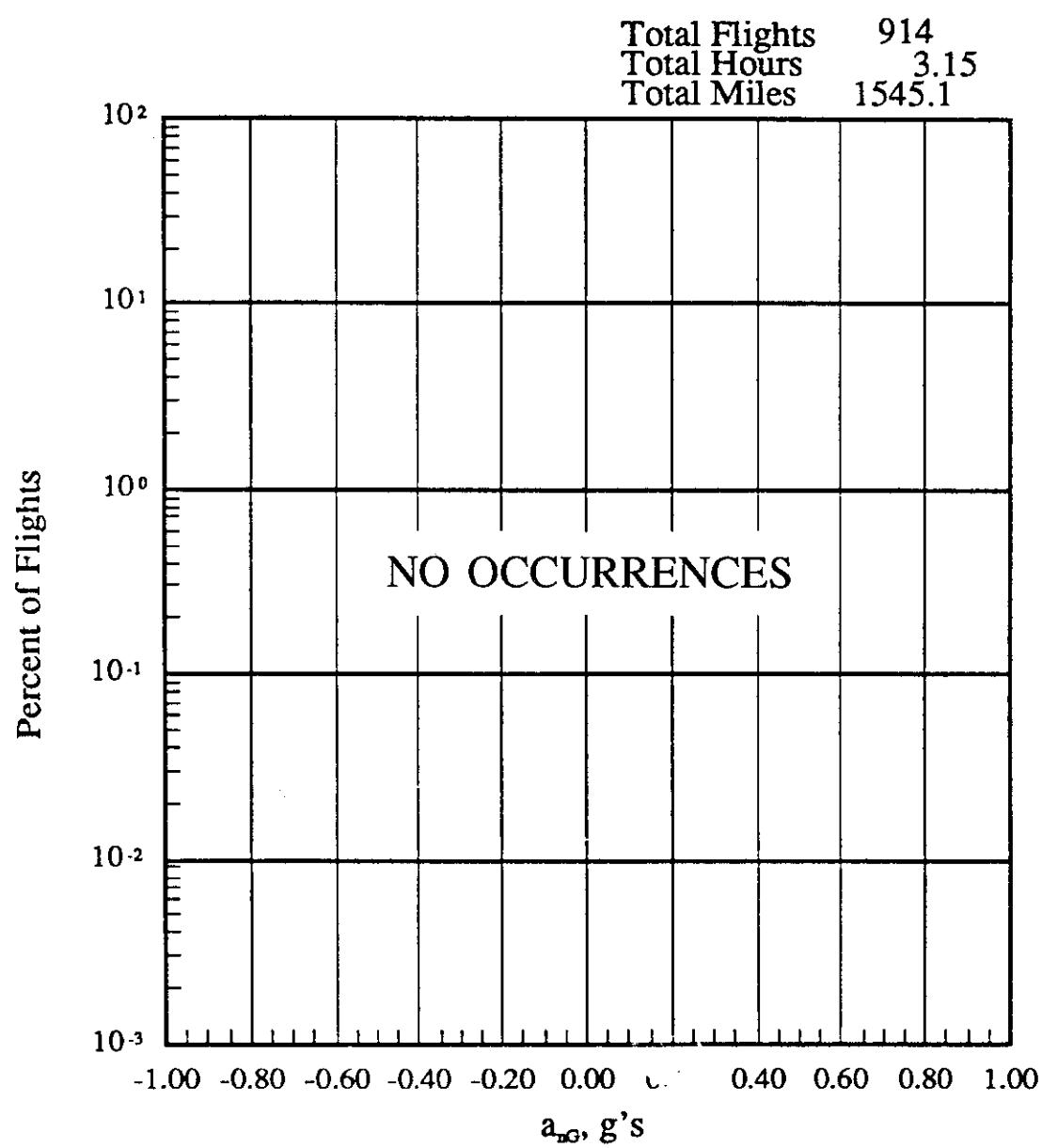
(h) 29500 to 34500 feet altitude

Figure 18.- Continued.



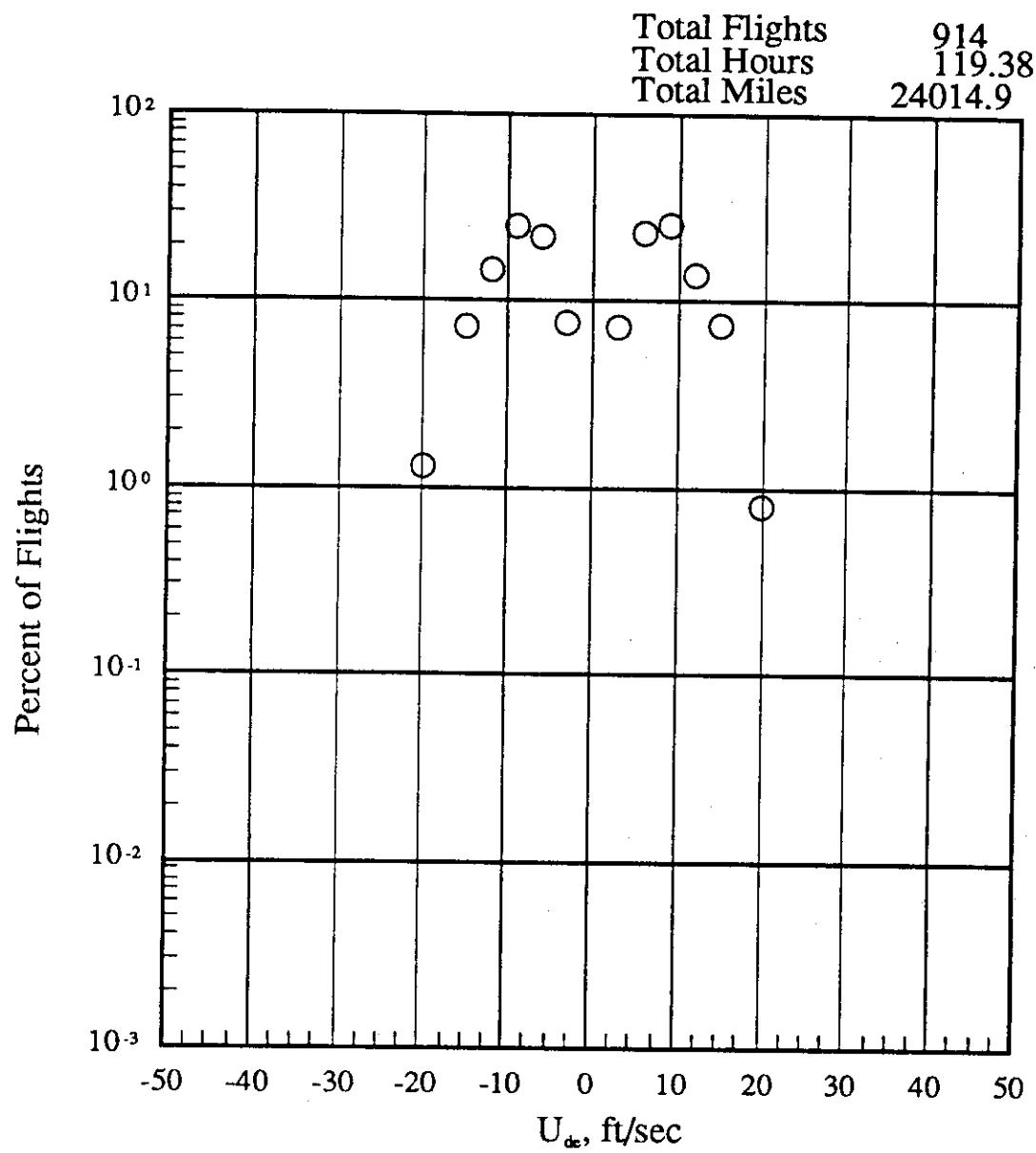
(k) -500 to 44500 feet altitude

Figure 18.- Concluded.



(j) 39500 to 44500 feet altitude

Figure 18.- Continued.



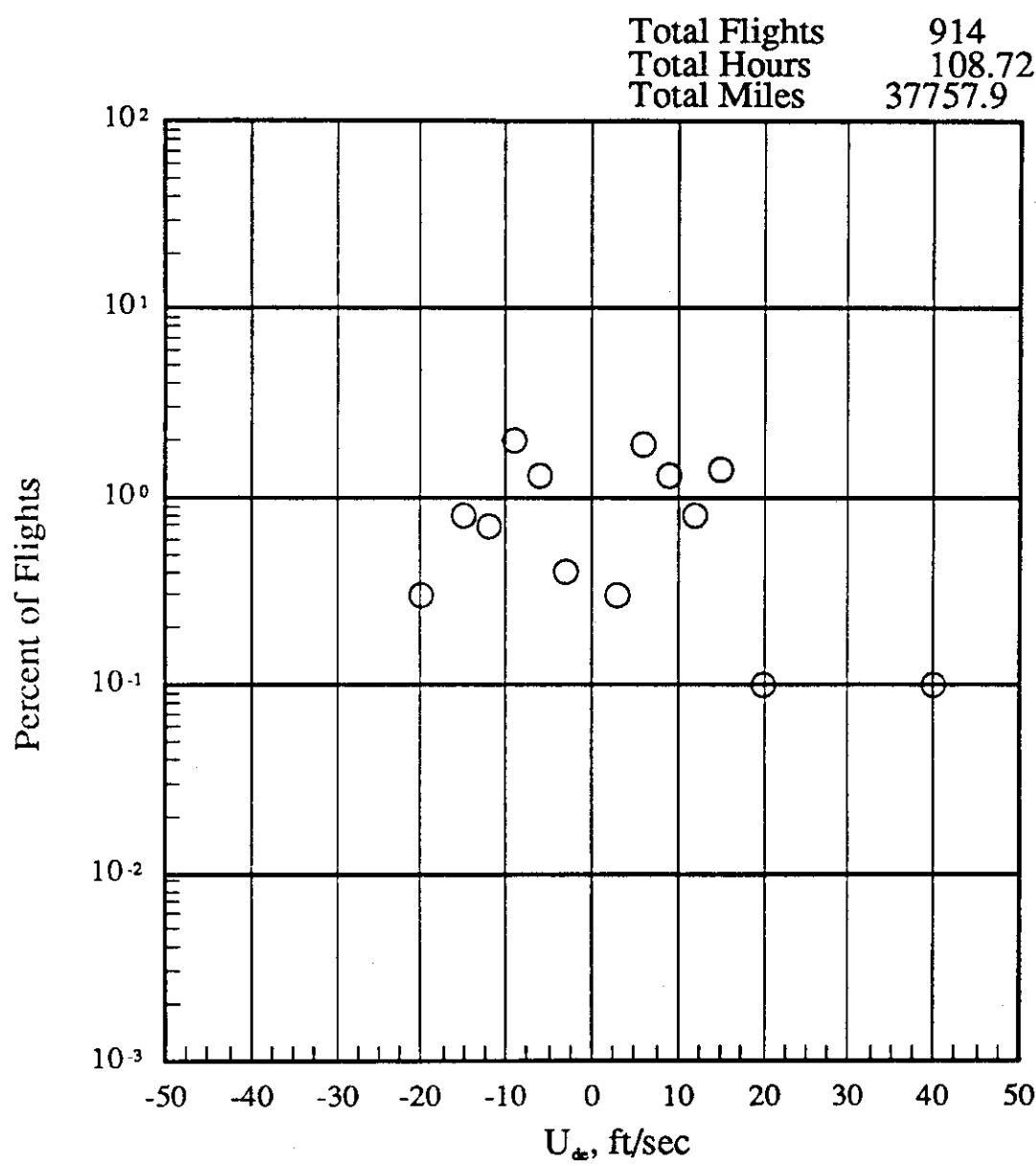
(b) -500 to 4500 feet altitude

Figure 19.- Continued.

MAXIMUM U <sub>DE</sub> LEVEL FOR EACH FLIGHT FT/SEC	-500 TO 4500 FT			4500 TO 9500 FT			9500 TO 14500 FT			14500 TO 19500 FT			19500 TO 24500 FT			24500 TO 29500 FT			29500 TO 34500 FT			34500 TO 39500 FT			39500 TO 44500 FT																										
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	44500 TO 45000 FT																																									
100	0	0	0	0	0	0	0	0	0	0																																									
90	0	0	0	0	0	0	0	0	0	0																																									
80	0	0	0	0	0	0	0	0	0	0																																									
70	0	0	0	0	0	0	0	0	0	0																																									
60	0	0	0	0	0	0	0	0	0	0																																									
50	0	0	0	0	0	0	0	0	0	0																																									
40	0	0	0	0	0	0	0	0	0	0																																									
30	0	0.1	0	0	0	0	0	0	0	0.1																																									
20	0.8	0.5	0.1	0.2	0	0	0	0	0	1.6																																									
15	7.5	1.8	1.4	0.2	0.1	0	0.1	0	0	11.2																																									
12	14.0	1.8	0.8	0.1	0.1	0	0.3	0	0	17.0																																									
9	25.7	3.6	1.3	0.4	0.1	0.1	0.1	0.3	0	31.7																																									
6	23.3	2.7	1.9	0.4	0.1	0.1	0.3	0.7	0	29.5																																									
3	7.3	0.7	0.3	0	0	0.1	0	0.3	0	8.8																																									
-3	7.7	0.7	0.4	0.1	0.1	0	0	0.2	0	9.2																																									
-6	22.2	2.7	1.3	0.5	0.1	0.1	0.4	1.3	0	28.8																																									
-9	25.3	2.5	2.0	0.4	0.1	0.3	0.1	0.2	0	31.0																																									
-12	14.8	1.6	0.7	0.2	0	0	0.1	0.3	0	17.7																																									
-15	7.3	2.3	0.8	0.1	0	0	0	0	0	10.5																																									
-20	1.3	1.0	0.3	0	0	0	0.1	0	0	2.7																																									
-30	0	0	0	0	0	0	0	0	0	0																																									
-40	0	0	0	0	0	0	0	0	0	0																																									
-50	0	0	0	0	0	0	0	0	0	0																																									
-60	0	0	0	0	0	0	0	0	0	0																																									
-70	0	0	0	0	0	0	0	0	0	0																																									
-80	0	0	0	0	0	0	0	0	0	0																																									
-90	0	0	0	0	0	0	0	0	0	0																																									
-100	0	0	0	0	0	0	0	0	0	0																																									
FLIGHT HOURS @ ALT			119.38			108.04			108.72			77.17			83.30			110.42			266.52			742.54			1619.24																								
FLIGHT MILES @ ALT			24014.89			23500.10			37757.94			31445.86			36596.71			52344.52			131369.93			363808.56			1545.14			708383.64																					
TOTAL FLIGHTS																																																			
914																																																			

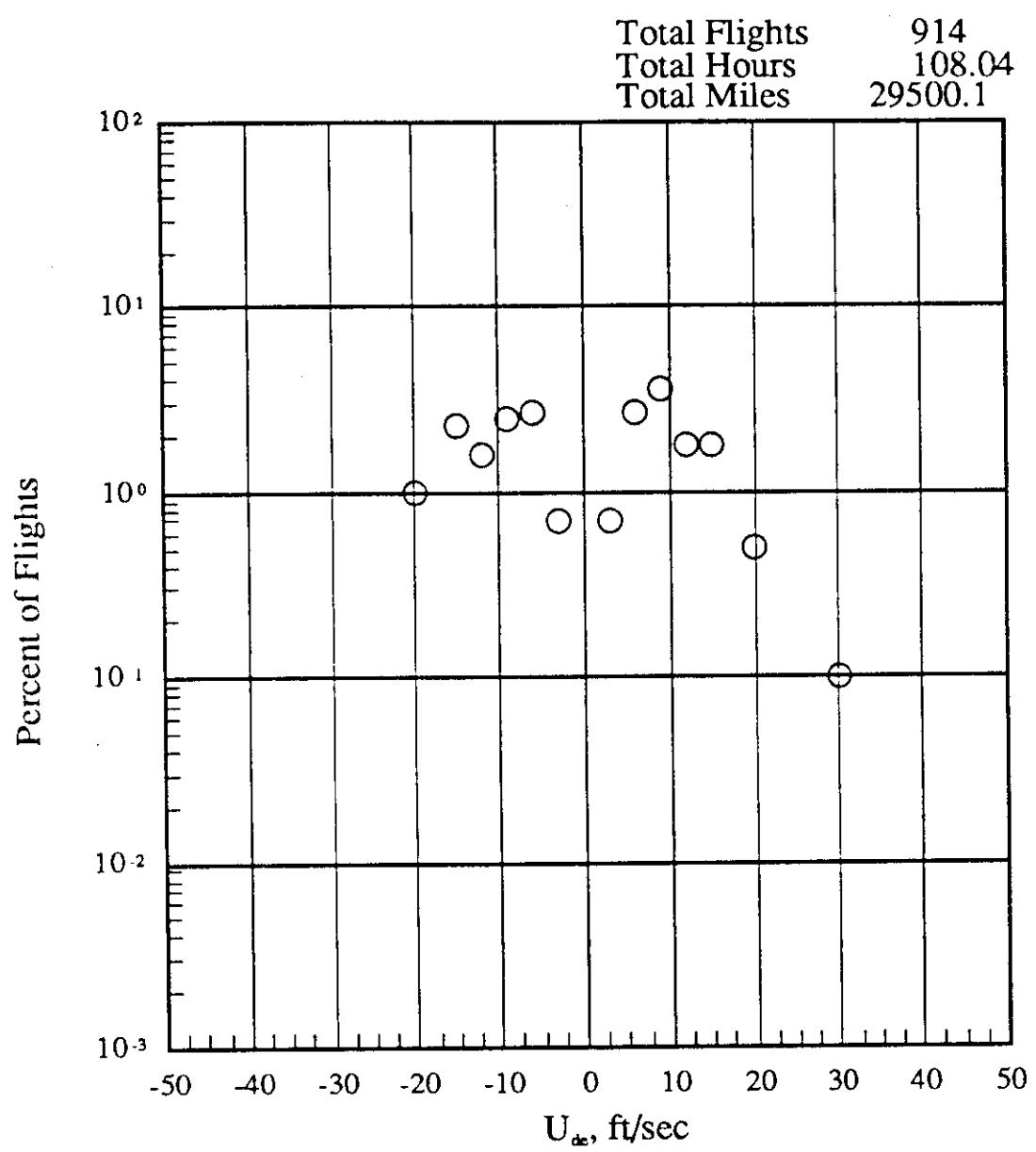
(a) Percent of flights where peak positive and negative U<sub>de</sub> per flight occurs within pressure altitude bands, any flap

Figure 19.- Peak positive and negative U<sub>de</sub> vs altitude.



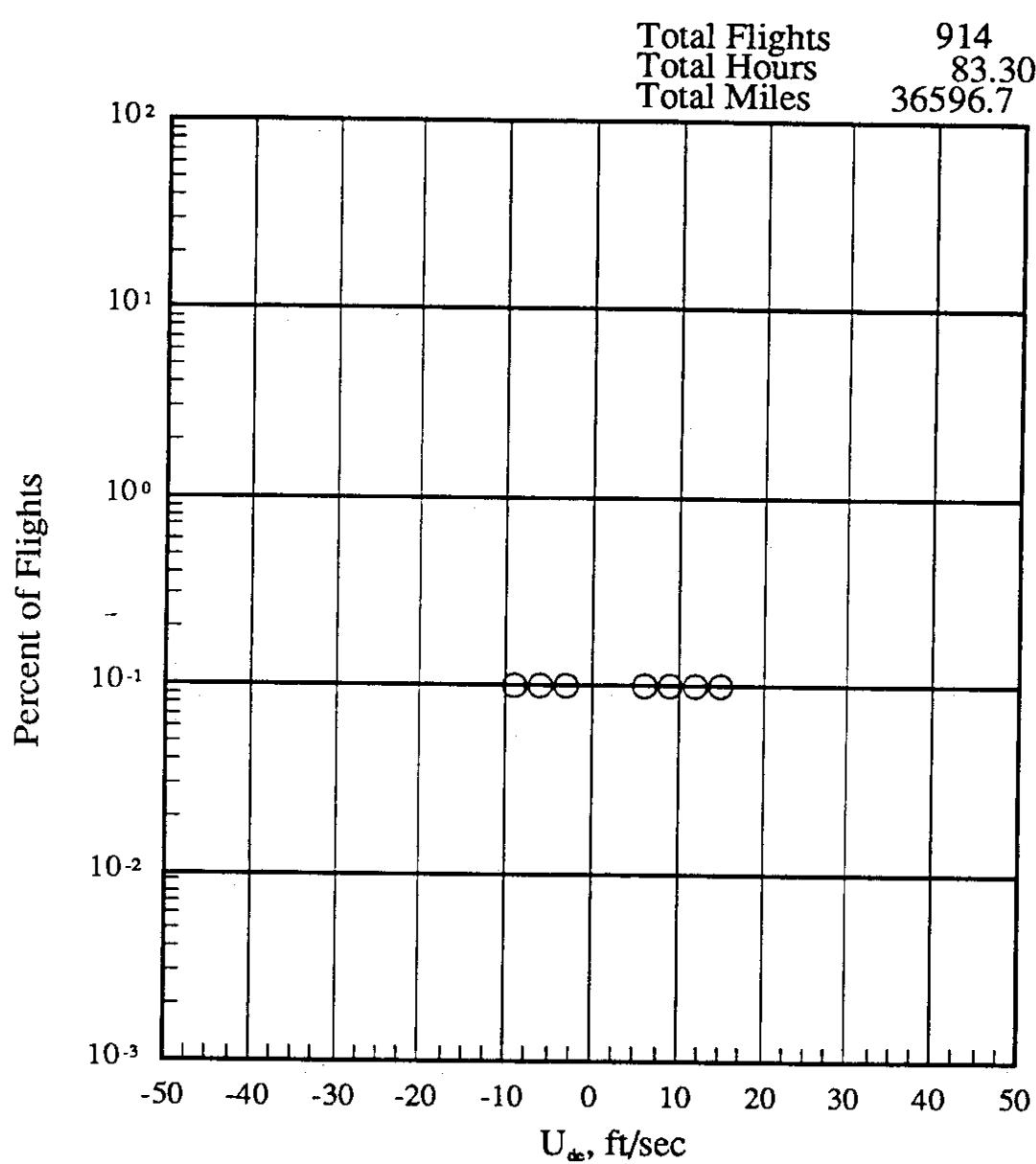
(d) 9500 to 14500 feet altitude

Figure 19.- Continued.



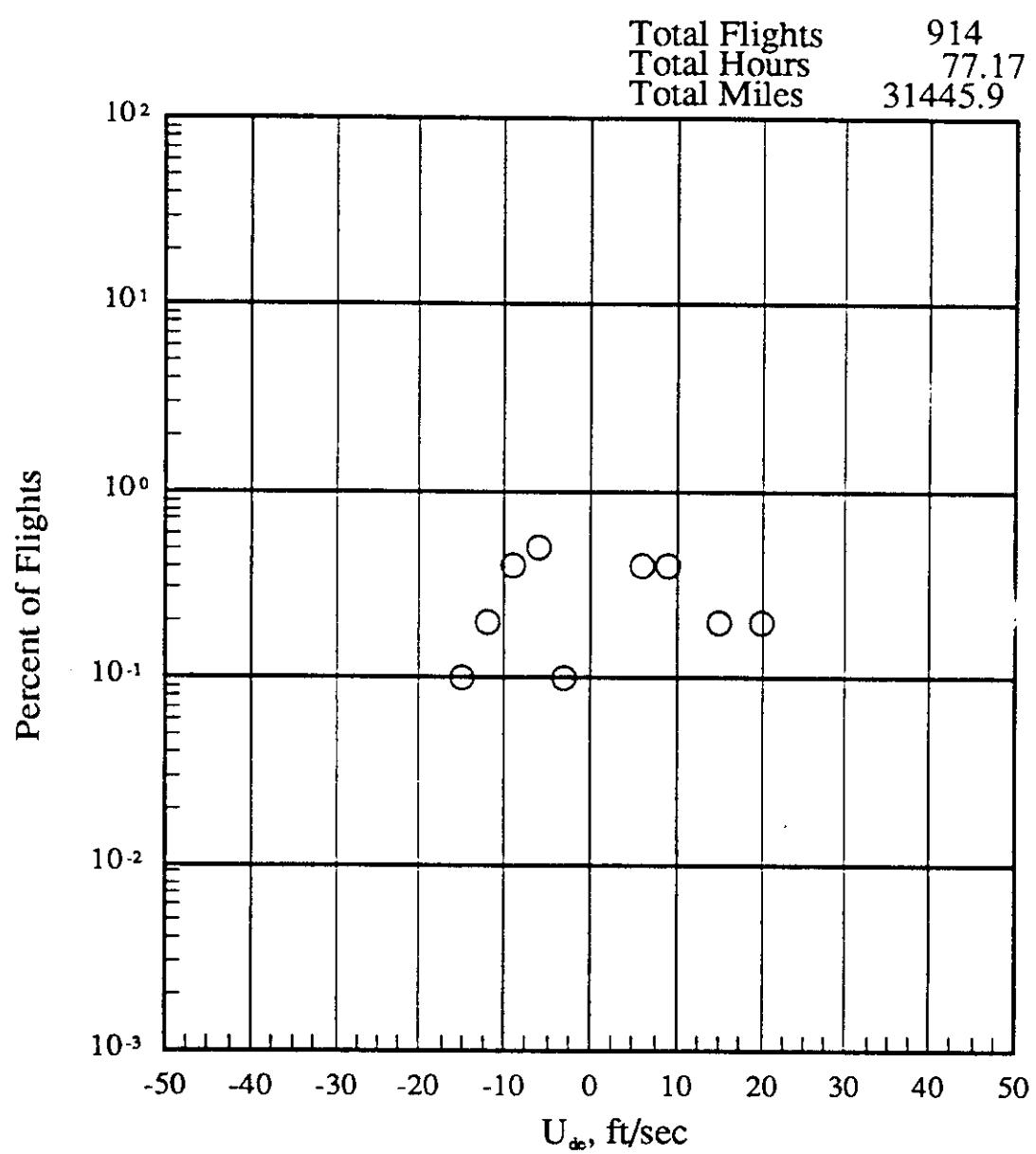
(c) 4500 to 9500 feet altitude

Figure 19.- Continued.



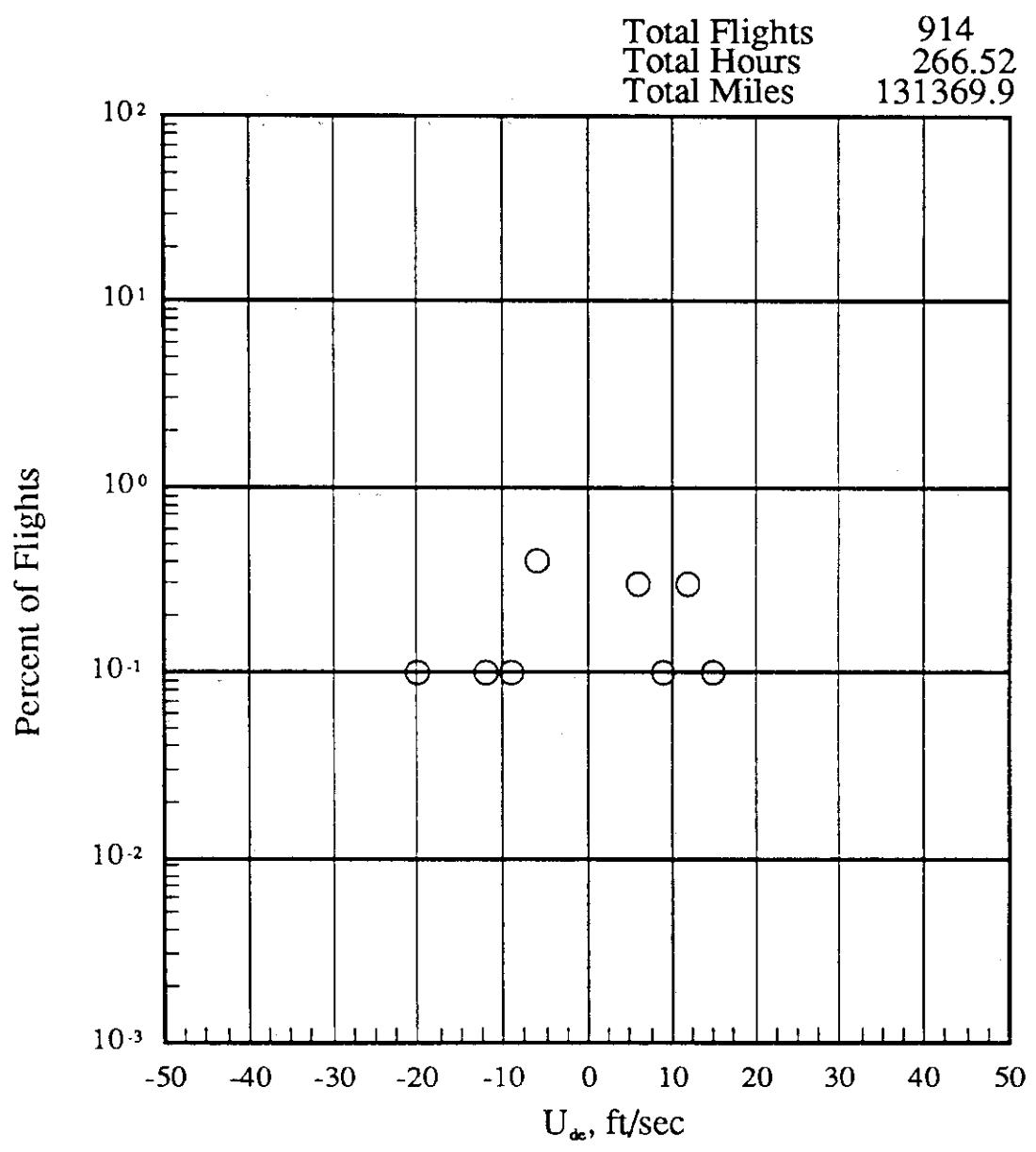
(f) 19500 to 24500 feet altitude

Figure 19.- Continued.



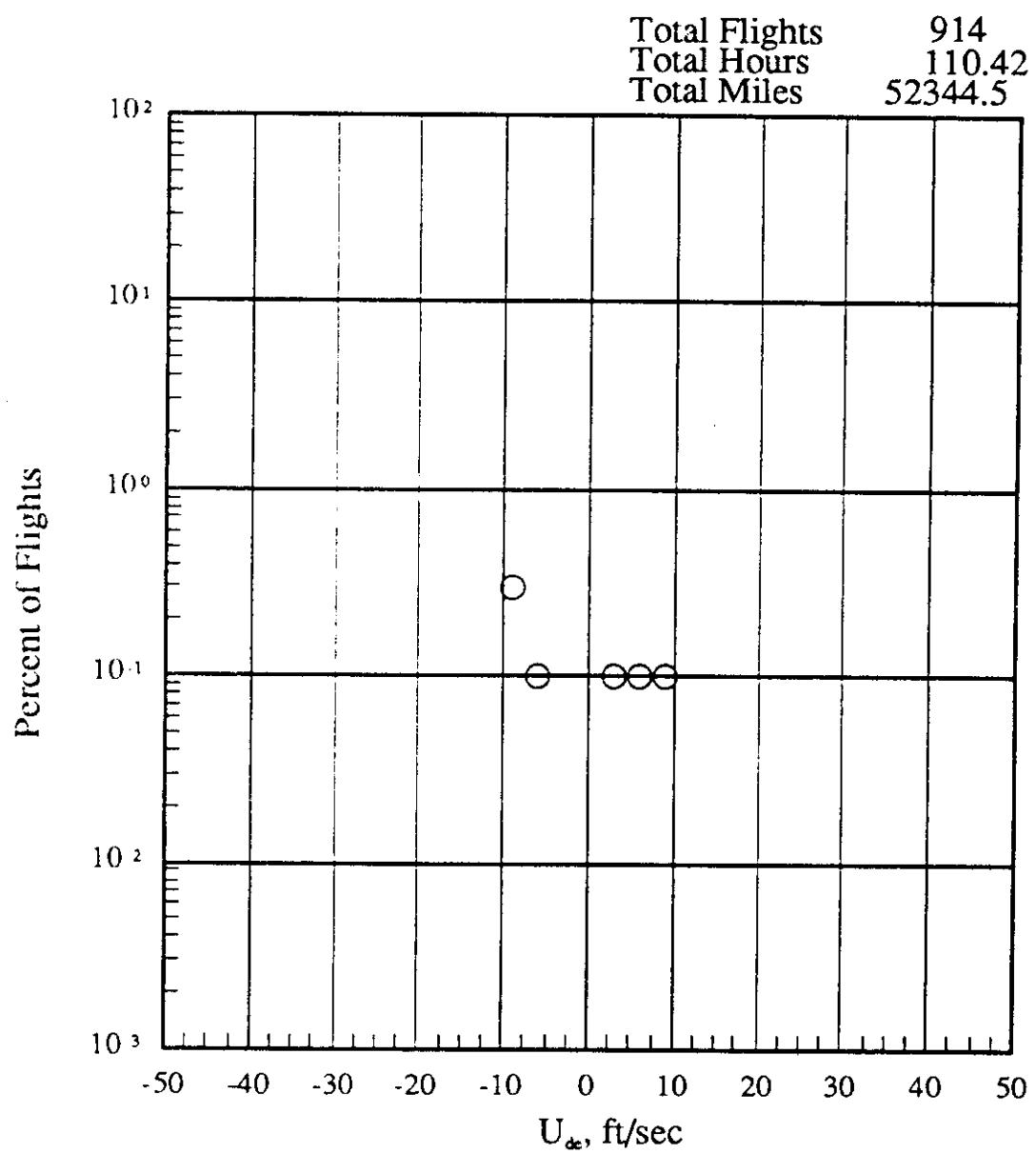
(e) 14500 to 19500 feet altitude

Figure 19.- Continued.



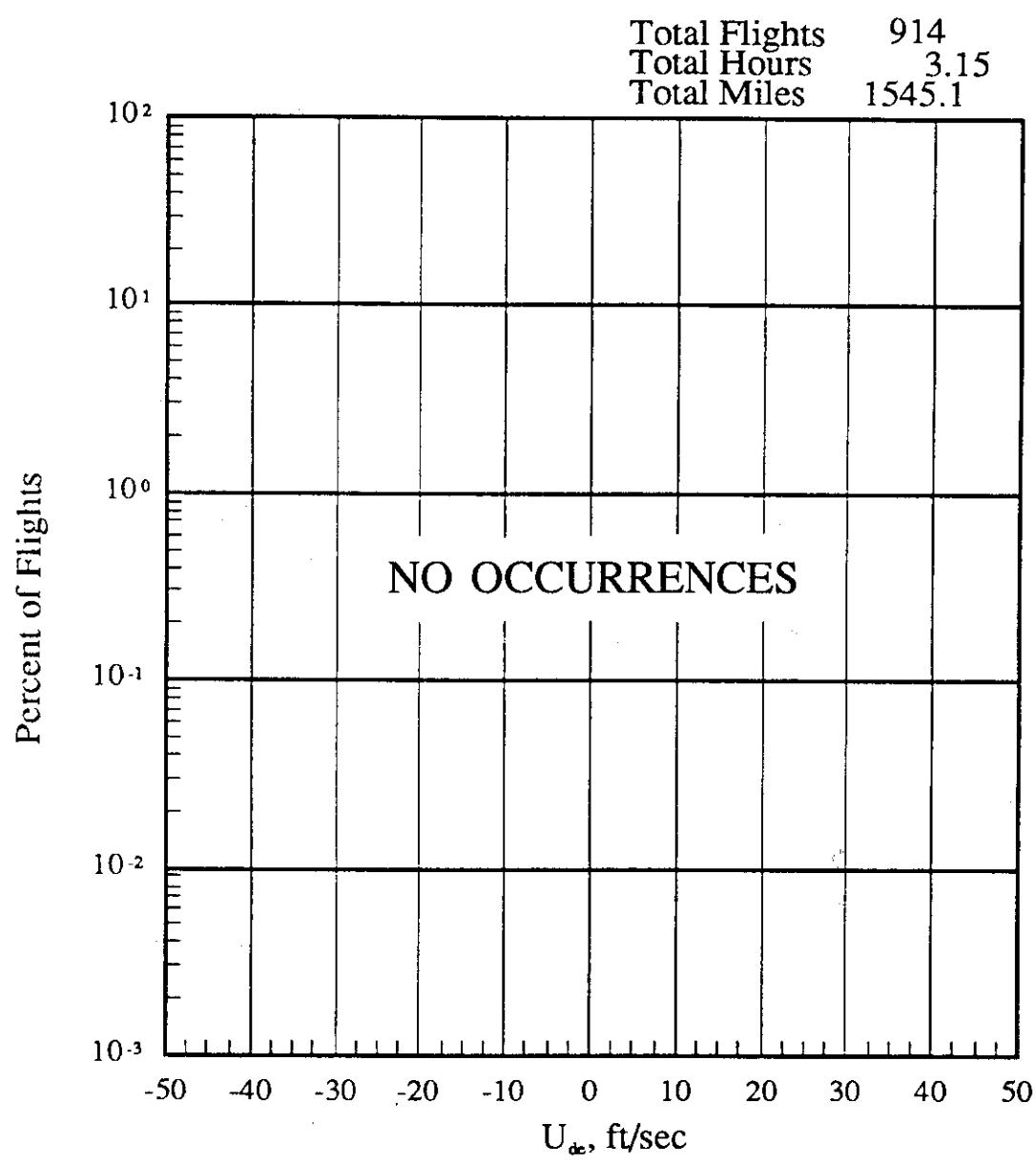
(h) 29500 to 34500 feet altitude

Figure 19.- Continued.



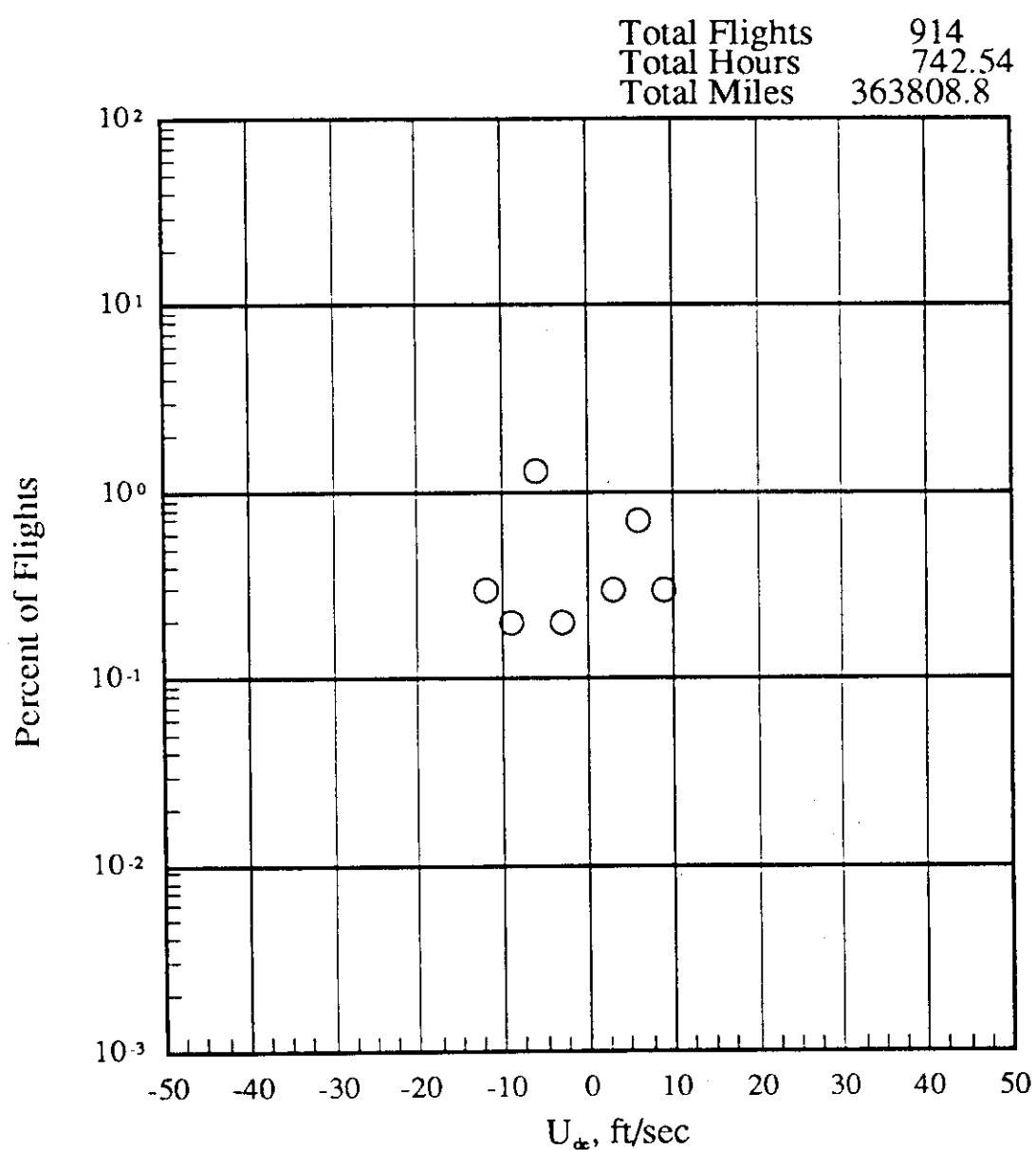
(g) 24500 to 29500 feet altitude

Figure 19.- Continued.



(j) 39500 to 44500 feet altitude

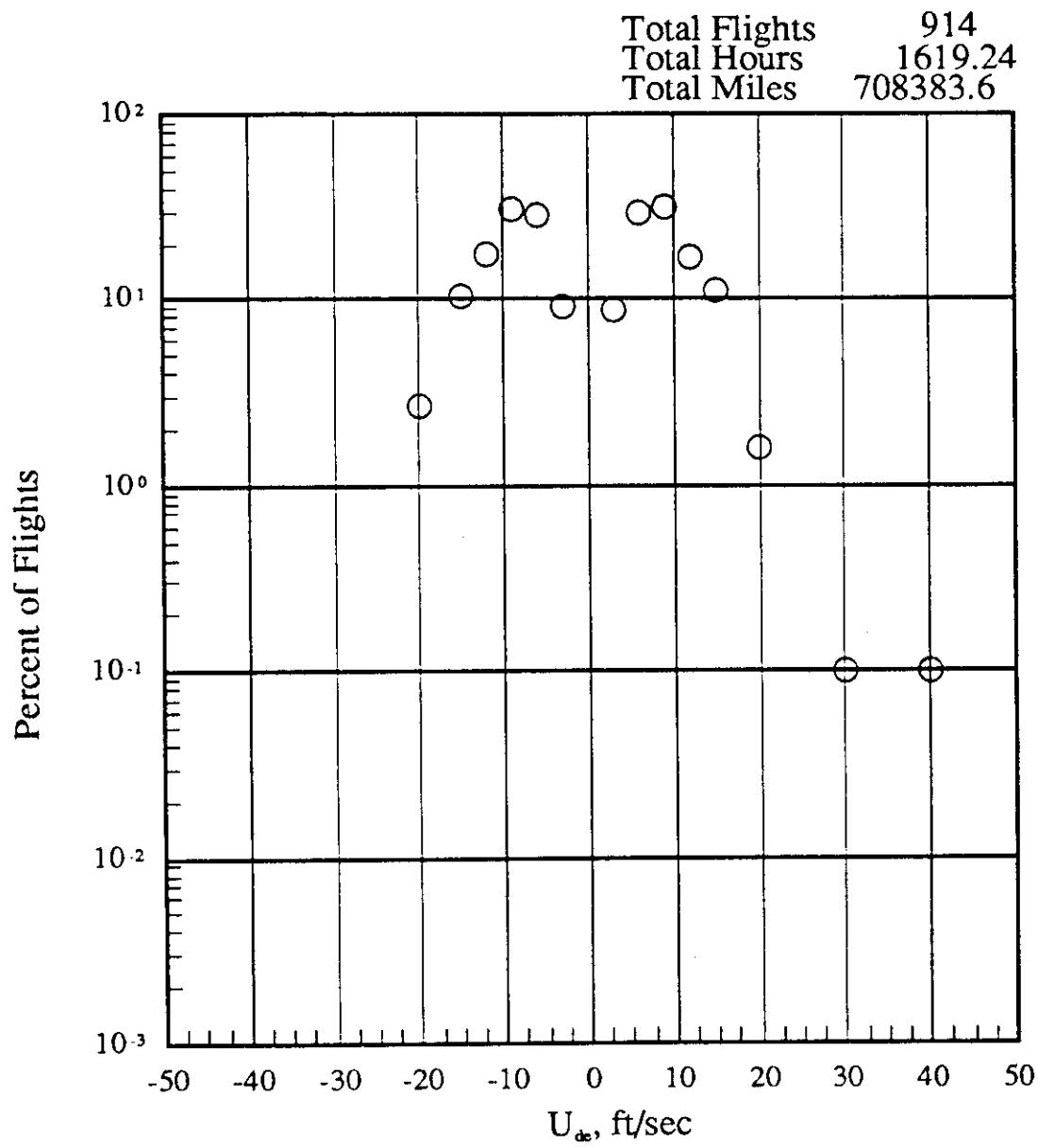
Figure 19.- Continued.



(i) 34500 to 39500 feet altitude

Figure 19.- Continued.

Figure 20.- a) Exceedances with flaps deflected.



(k) -500 to 44500 feet altitude

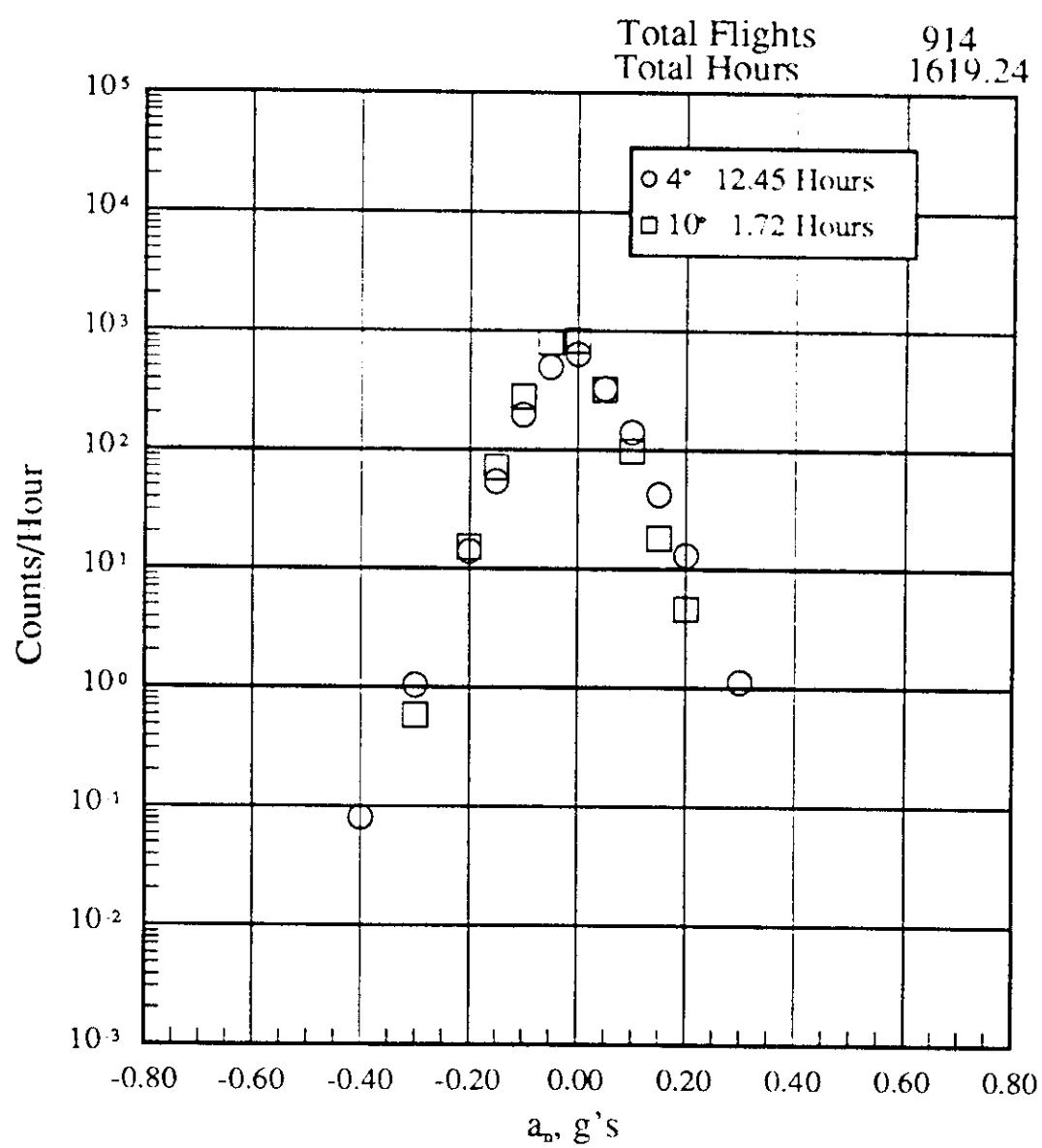
Figure 19.- Concluded.

## FLAP DETENT

<i>a'</i> in LEVEL	g's	4	10	18	22	27	33	42
1.60	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0
.50	0.263	0.071	0	0	0	0	0	0
.40	0.657	0.179	0	0.171	0	0	0	0
.30	3.089	1.251	2.048	0.983	0	0.284	0.791	
.20	16.034	14.332	15.971	11.028	9.943	2.889	6.856	
.15	45.081	45.318	54.055	34.621	37.964	16.768	22.414	
.10	140.039	130.522	167.899	113.695	137.393	86.918	112.466	
.05	293.418	286.633	395.177	308.942	390.484	403.185	495.483	
0	832.478	793.388	731.384	806.848	687.866	1109.944	1197.836	
-.05	185.711	188.349	199.431	201.488	361.559	351.508	389.214	
-.10	55.858	47.427	49.141	42.700	105.756	66.882	71.593	
-.15	13.209	9.507	10.238	7.736	23.501	10.752	12.657	
-.20	4.797	2.931	3.276	1.453	2.712	2.416	2.769	
-.30	0.854	0.179	0.410	0.128	0	0.189	0	
-.40	0.066	0.036	0	0	0	0	0	
-.50	0	0	0	0	0	0	0	
-.60	0	0	0	0	0	0	0	
-.70	0	0	0	0	0	0	0	
-.80	0	0	0	0	0	0	0	
-.90	0	0	0	0	0	0	0	
-.1.00	0	0	0	0	0	0	0	
-.1.20	0	0	0	0	0	0	0	
-.1.40	0	0	0	0	0	0	0	
-.1.60	0	0	0	0	0	0	0	
<b>FLIGHT HOURS</b>								
IN DETENT	15.217	27.980	2.442	23.396	1.106	21.112	7.585	
TOTAL FLIGHTS								98.84
TOTAL FLIGHT HOURS								914
TOTAL FLIGHT HOURS FLAPS UP & DOWN								1619.24
TOTAL FLIGHT MILES FLAPS UP AND DOWN								708383.60

(c) Landing

Figure 20.- Continued.



(b) Take off

Figure 20.- Continued.

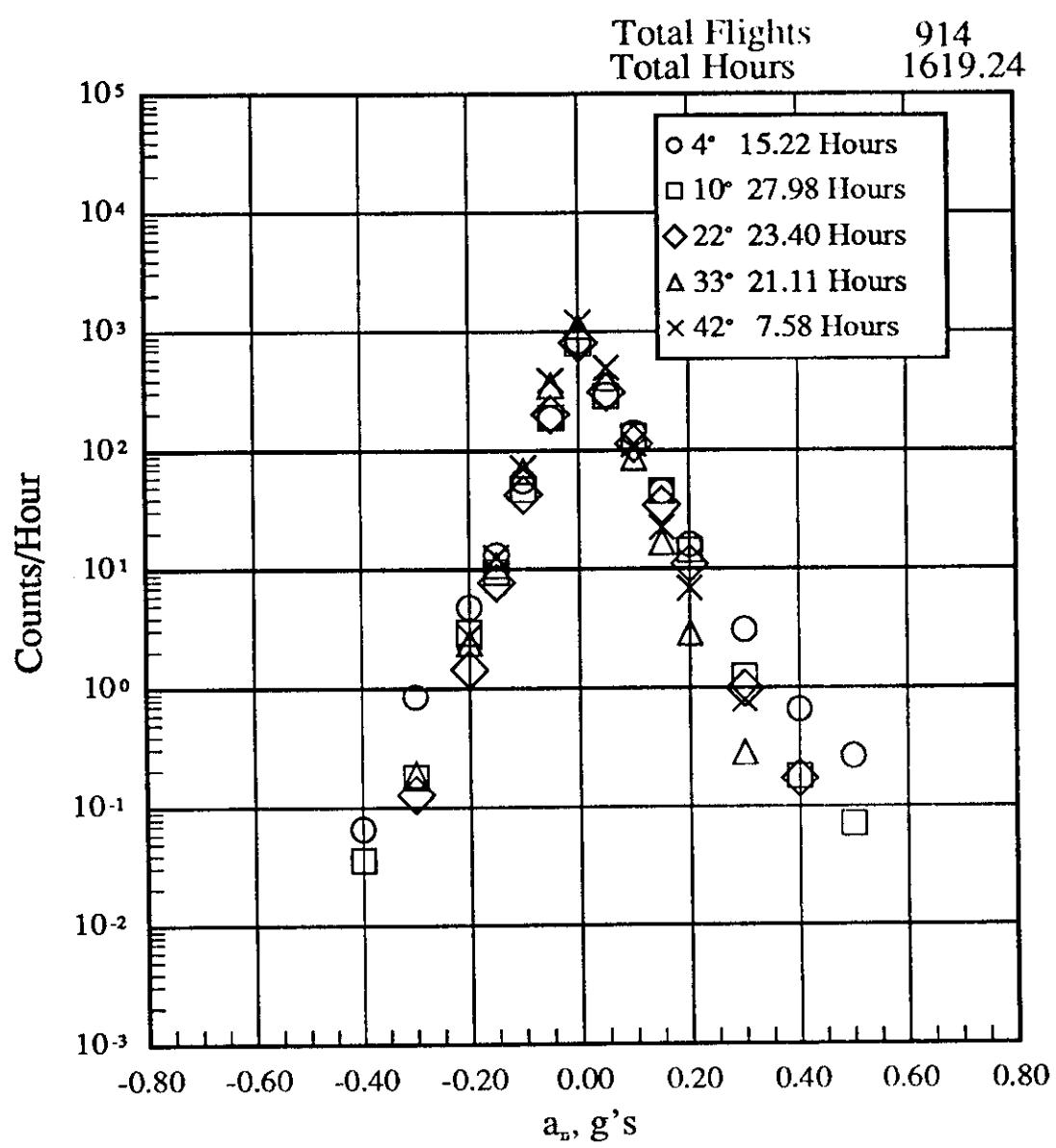
MAXIMUM AIR LEVEL FOR EACH FLIGHT		120 TO 130 130 KTS	130 TO 140 140 KTS	140 TO 150 150 KTS	150 TO 160 160 KTS	160 TO 170 170 KTS	170 TO 180 180 KTS	180 TO 190 190 KTS	190 TO 200 200 KTS	200 TO 210 210 KTS	210 TO 220 220 KTS	220 TO 230 230 KTS	230 TO 240 240 KTS	240 TO 250 250 KTS	250 TO 260 260 KTS	260 TO 270 270 KTS	270 TO 280 280 KTS	280 TO 290 290 KTS	290 TO 300 300 KTS	300 TO 310 310 KTS	310 TO 320 320 KTS
q' = FROM TO																					
1.60	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.70	.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.60	.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.50	.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.40	.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.30	.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.20	.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.15	.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.10	.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
.05	.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.05	-.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.10	-.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.15	-.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.20	-.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.30	-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.40	-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.50	-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.60	-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.70	-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.80	-.100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.100	-.120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.120	-.140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.140	-.160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
-.160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL PEAKS @ EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT HOURS @ EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
FLIGHT MILES @ EAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

TOTAL FLIGHTS INCLUDED  
TOTAL FLIGHTS ANALYZED  
TOTAL FLIGHT HOURS, ANY FLAP  
TOTAL FLIGHT MILES, ANY FLAP

913  
914  
1619.24  
70833.64

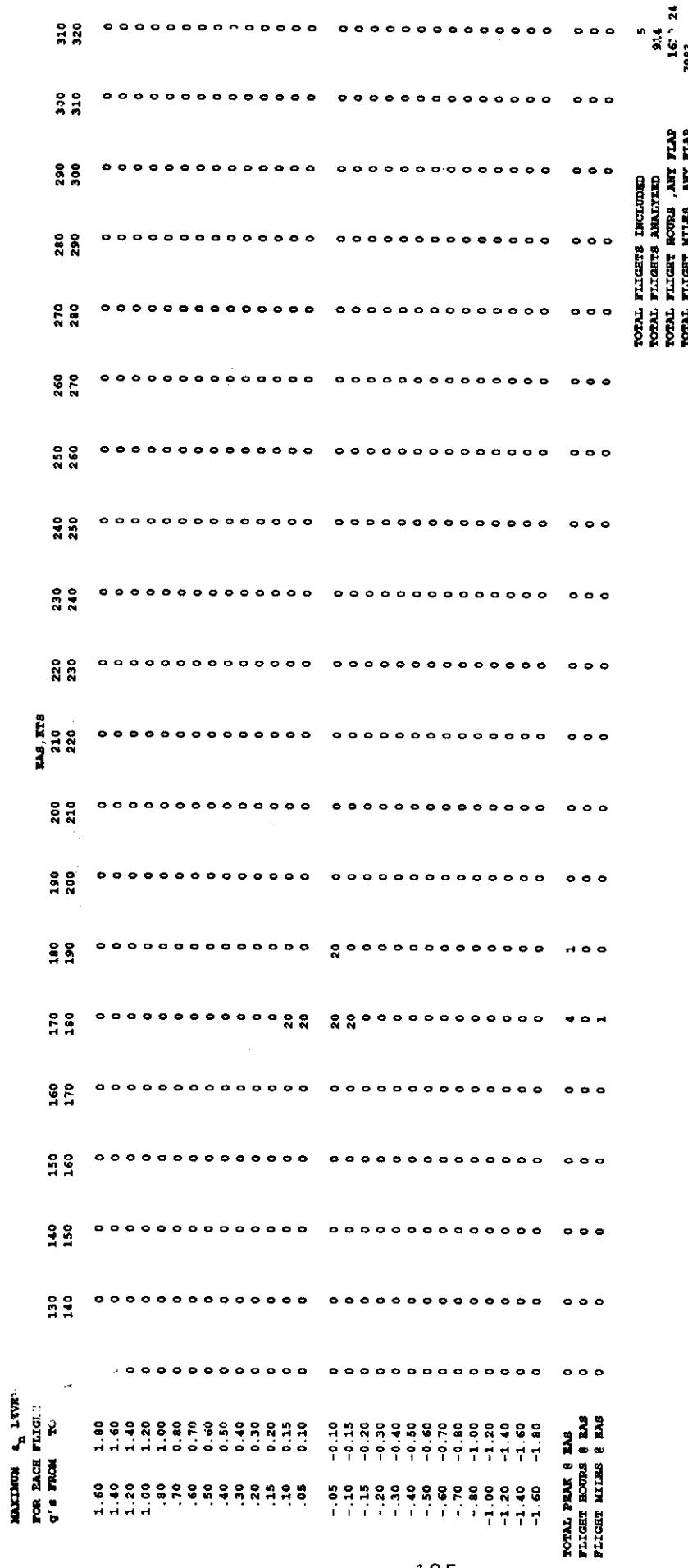
(a) Take off, flaps 4 degree detent

Figure 21.- Percent of flights with peak positive and negative  $a_n$  per flight vs. EAS bands.



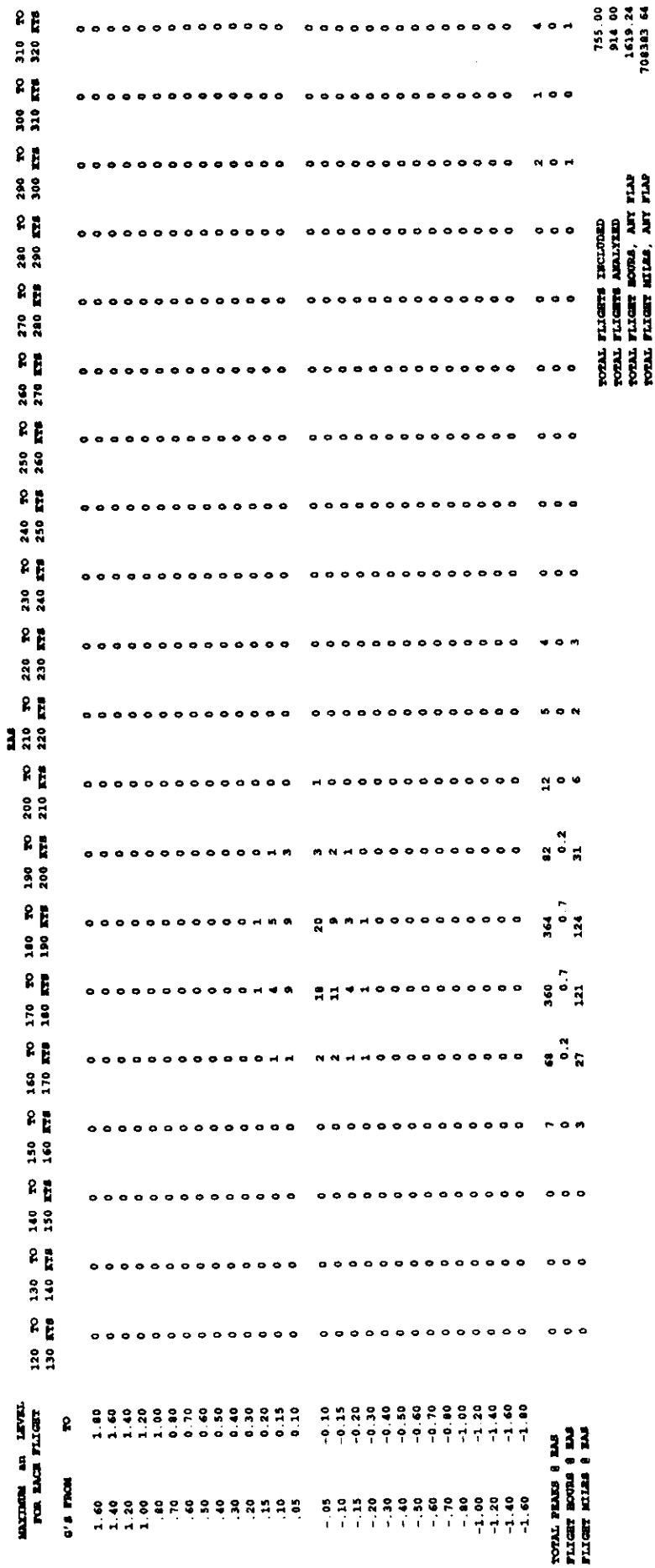
(d) Landing.

Figure 20.- Concluded.



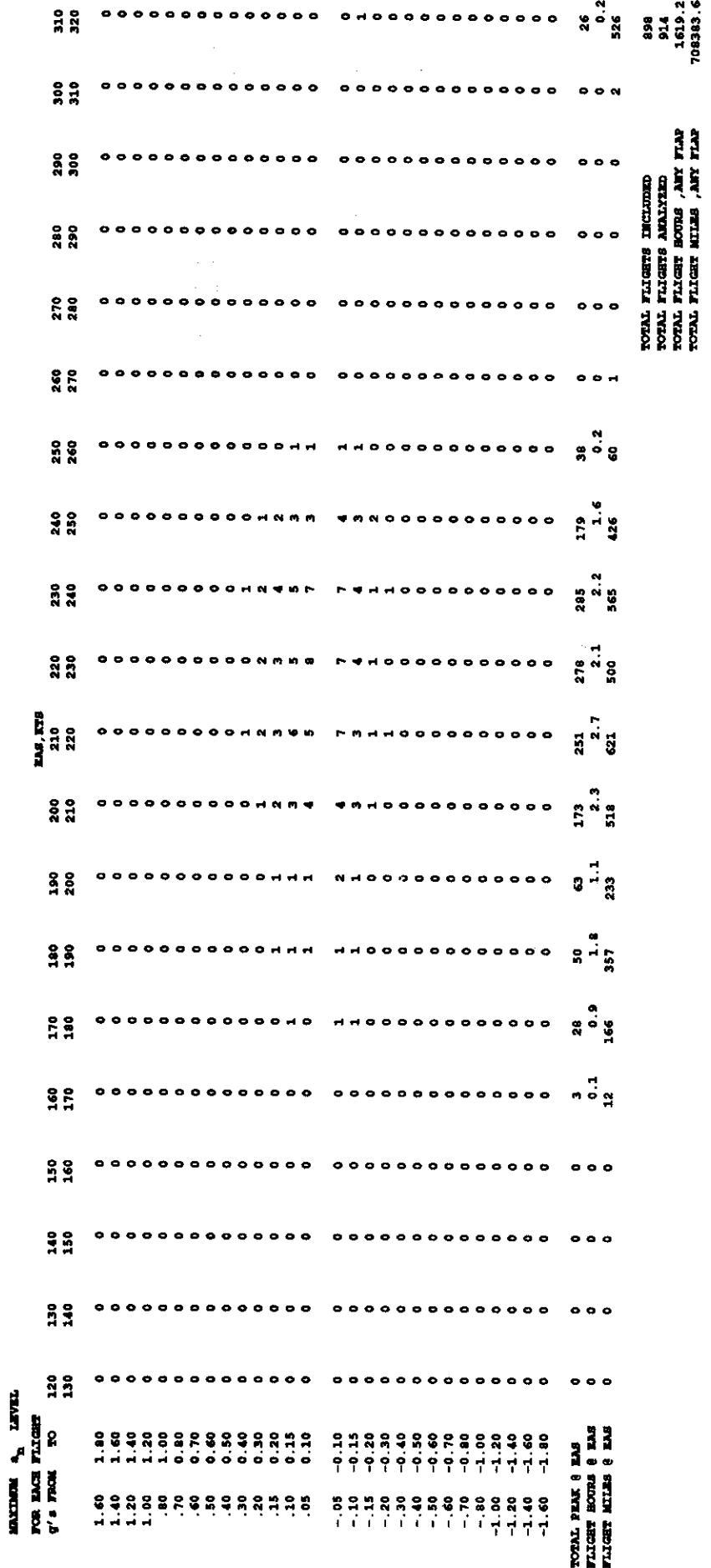
(c) Take off; flap 18 degree detent

Figure 21.- Continued.



(b) Take off; flap 10 degree detent

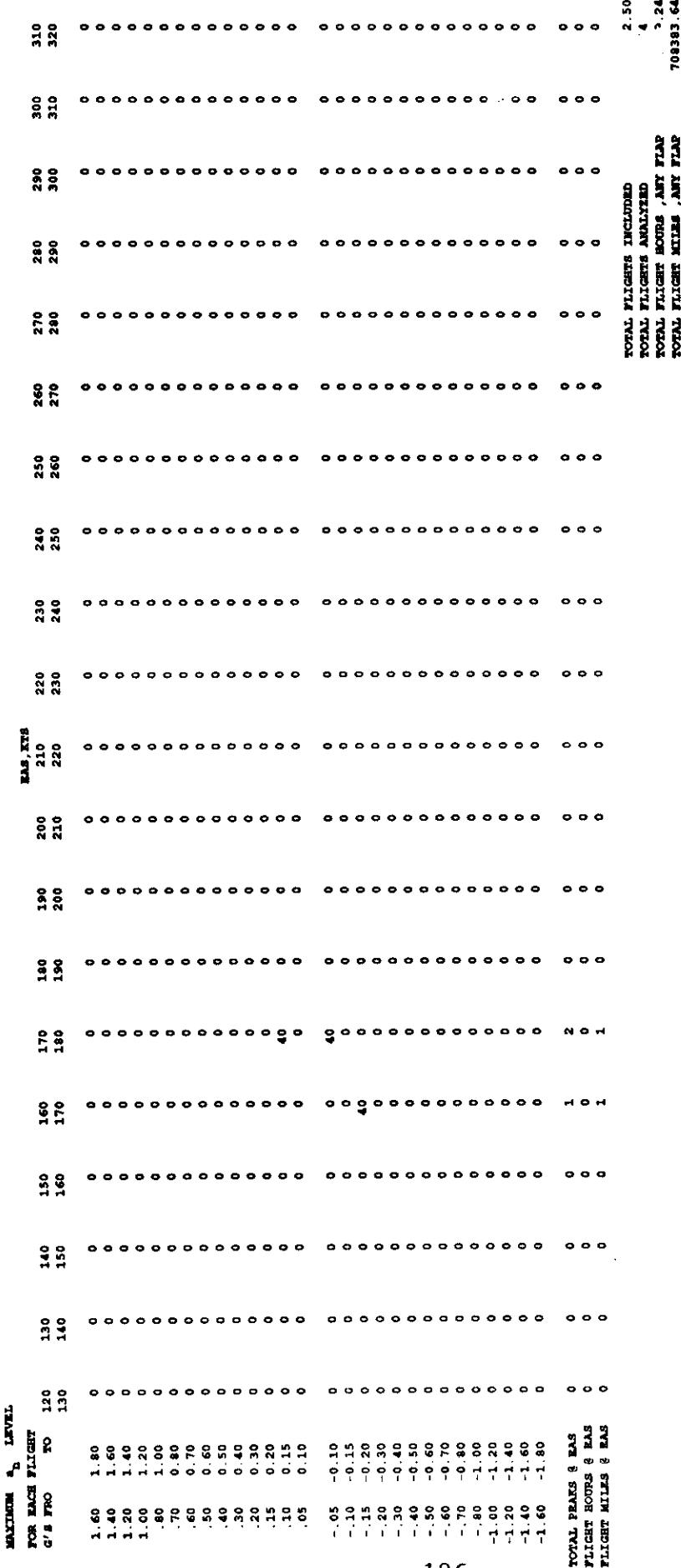
Figure 21.- Continued.



TOTAL FLIGHTS INCLUDED 398  
 TOTAL FLIGHTS ANALYZED 914  
 TOTAL FLIGHTS BOUND , ANY FLAP 1619.24  
 TOTAL FLIGHT METAS , ANY FLAP 70383.64

(e) Landing; flaps 4 degree detent

Figure 21.- Continued.



(d) Take off; flap 22 degree defent

Figure 21.- Continued.

(g) Landing; flaps 18 degree detent

Figure 21.- Continued.

MAXIMUM $\frac{V_2}{V}$ LEVEL FOR EACH FLIGHT	MACH, ETS									
	120	130	140	150	160	170	180	190	200	210
g's & TRACK TO	200	210	220	230	240	250	260	270	280	290
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0
.70	0.90	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	0	0	0	0
- .05	-0.10	0	0	0	0	0	0	0	0	0
- .10	-0.15	0	0	0	0	0	0	0	0	0
- .15	-0.20	0	0	0	0	0	0	0	0	0
- .20	-0.30	0	0	0	0	0	0	0	0	0
- .30	-0.40	0	0	0	0	0	0	0	0	0
- .40	-0.50	0	0	0	0	0	0	0	0	0
- .50	-0.60	0	0	0	0	0	0	0	0	0
- .60	-0.70	0	0	0	0	0	0	0	0	0
- .80	-1.00	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0
TOTAL FLIGHTS & ETS	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & ETS	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES & ETS	0	0	0	0	0	0	0	0	0	0
128	18	104	203	223	233	246	256	267	281	290
	4.0	3.1	5.7	5.0	4.1	4.0	4.1	4.2	4.2	4.2
	60	551	1069	965	701	902	932	425	42	2
TOTAL FLIGHTS INCLUDED	909.50									
TOTAL FLIGHTS ANALYZED	914									
TOTAL FLIGHTS HOURS , ANY FLAP	1619.24									
TOTAL FLIGHTS MILES , ANY FLAP	703383.64									

(f) Landing; flaps 10 degree detent

Fig. 21.-Continued.

MANUFACTURE $\alpha_m$ LEVEL FOR EACH FLIGHT		IAS, KTS												TOTAL FLIGHTS INCLUDED								
		120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320
g's FROM	TO																					
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.70	0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.60	0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.50	0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.40	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.30	0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.20	0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.15	0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.10	0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
.05	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.05	-0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.10	-0.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.15	-0.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.20	-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.30	-0.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.40	-0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.50	-0.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.60	-0.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.70	-0.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-0.80	-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL FLIGHTS 6 HRS		1	33	282	329	43	7	1	0	0	2	4	0	0	1	0	0	0	0	0	0	0
FLIGHT HOURS 6 HRS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLIGHT MILES 6 HRS		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL FLIGHTS INCLUDED  
TOTAL FLIGHTS ANALYZED  
TOTAL FLIGHT HOURS , ANY FLAP  
TOTAL FLIGHT MILES , ANY FLAP

507  
916  
1619.24  
708331.64

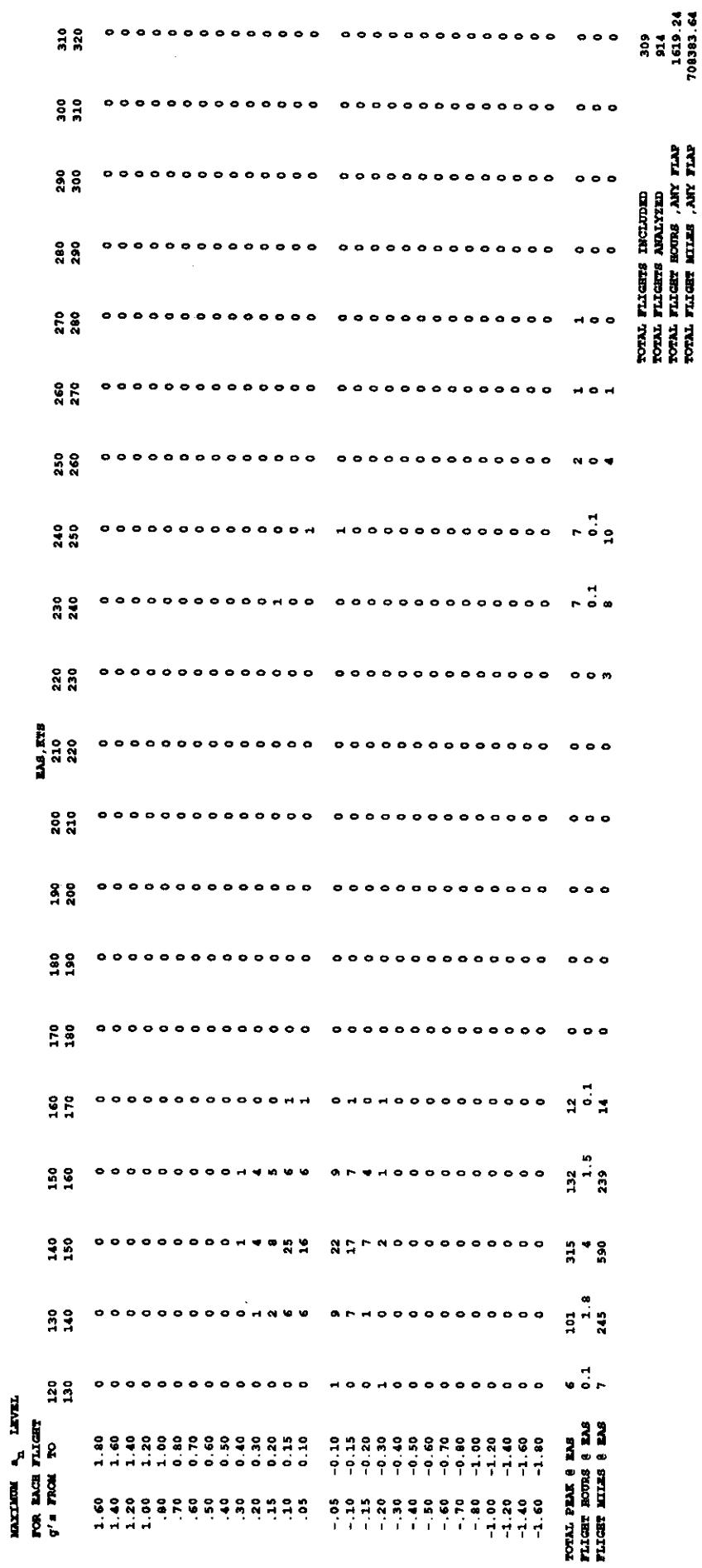
(i) Landing; flaps 27 degree detent

Figure 21.- Continued.

MAXIMUM $\alpha_{\text{L}}$ LEVEL		ANGLE, RADS																																		
FOR EACH FLIGHT		120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320														
g's FROM TO	g's FROM TO	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320		
1.60	1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.40	1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.20	1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1.00	1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.80	1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.70	.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.60	.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.50	.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.40	.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.30	.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.20	.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.15	.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.10	.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
.05	.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.05	-.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.10	-.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.15	-.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.20	-.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.30	-.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.40	-.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.50	-.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.60	-.70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.70	-.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.80	-.90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-.90	-.100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-1.00	-1.20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-1.20	-1.40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-1.40	-1.60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
-1.60	-1.80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
TOTAL FLIGHTS & MILES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
FLIGHT HOURS & MILES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
FLIGHT MILES & HRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
TOTAL FLIGHTS INCLUDED	913																																			
TOTAL FLIGHTS ANALYZED	914																																			
TOTAL FLIGHTS, ANY FLAP	1619	24																																		
TOTAL FLIGHT MILES, ANY FLAP	708383	64																																		

(h) Landing, flaps 22 degree detent

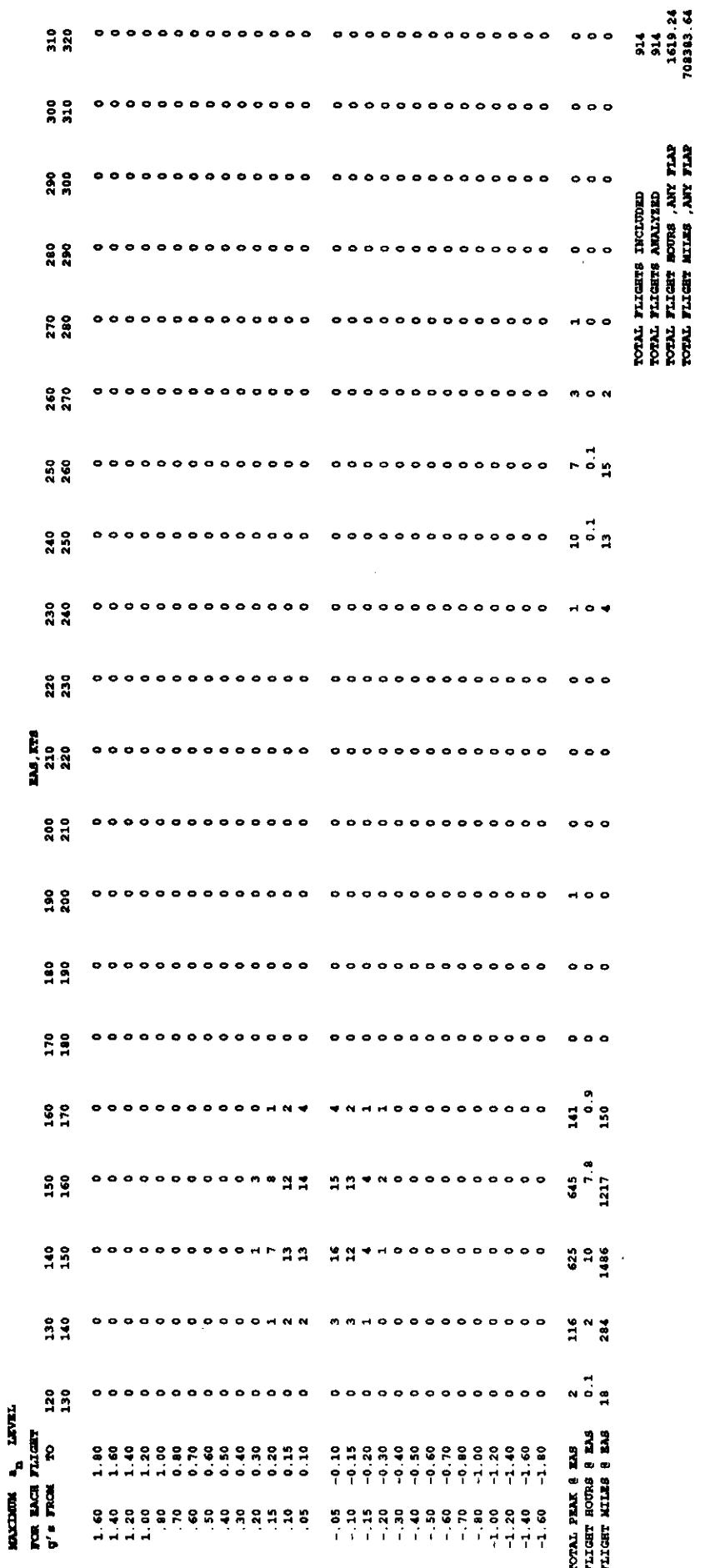
Figure 21.- Continued.



TOTAL FLIGHTS INCLUDED 309  
 TOTAL FLIGHTS ANALYZED 914  
 TOTAL FLIGHTS SCORING ANY FLAP 1619.24  
 TOTAL FLIGHTS MILES ,ANY FLAP 70383.64

(k) Landing; flaps 42 degree detent

Figure 21.- Concluded.



(j) Landing; flaps 33 degree detent

Figure 21.- Continued.

## PRESSURE ALTITUDE BANDS

$a_{nM}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL										
g's										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.30	0.22	0	0	0	1.25	0	0	0	0	0.13
.20	2.32	0.55	0.89	0	2.50	0	0	0	0	1.14
.15	8.62	2.47	3.57	0	5.00	0	0	0	0	4.18
.10	26.84	15.63	12.50	3.61	11.24	0	0	1.03	0	14.64
.05	58.88	35.91	41.52	21.14	23.73	19.21	23.63	7.58	4.14	37.08
0.00	171.01	149.68	134.39	124.80	123.66	145.69	135.49	199.90	208.40	162.64
-.05	36.79	22.48	25.10	21.66	28.73	11.50	15.75	8.27	1.38	24.72
-.10	6.85	4.66	5.80	2.58	3.75	0	0	0.34	0	4.26
-.15	0.99	0.82	0.89	0.52	0	0	0	0	0	0.63
-.20	0.11	0.55	0	0	0	0	0	0	0	0.13
-.30	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26
TOTAL FLIGHTS										56
TOTAL FLIGHT HOURS FLAPS UP AND DOWN										23.71
TOTAL FLIGHT MILES FLAPS UP AND DOWN										7616.26

(b)  $a_{nM}$  Level crossing counts per hour within pressure altitude bands

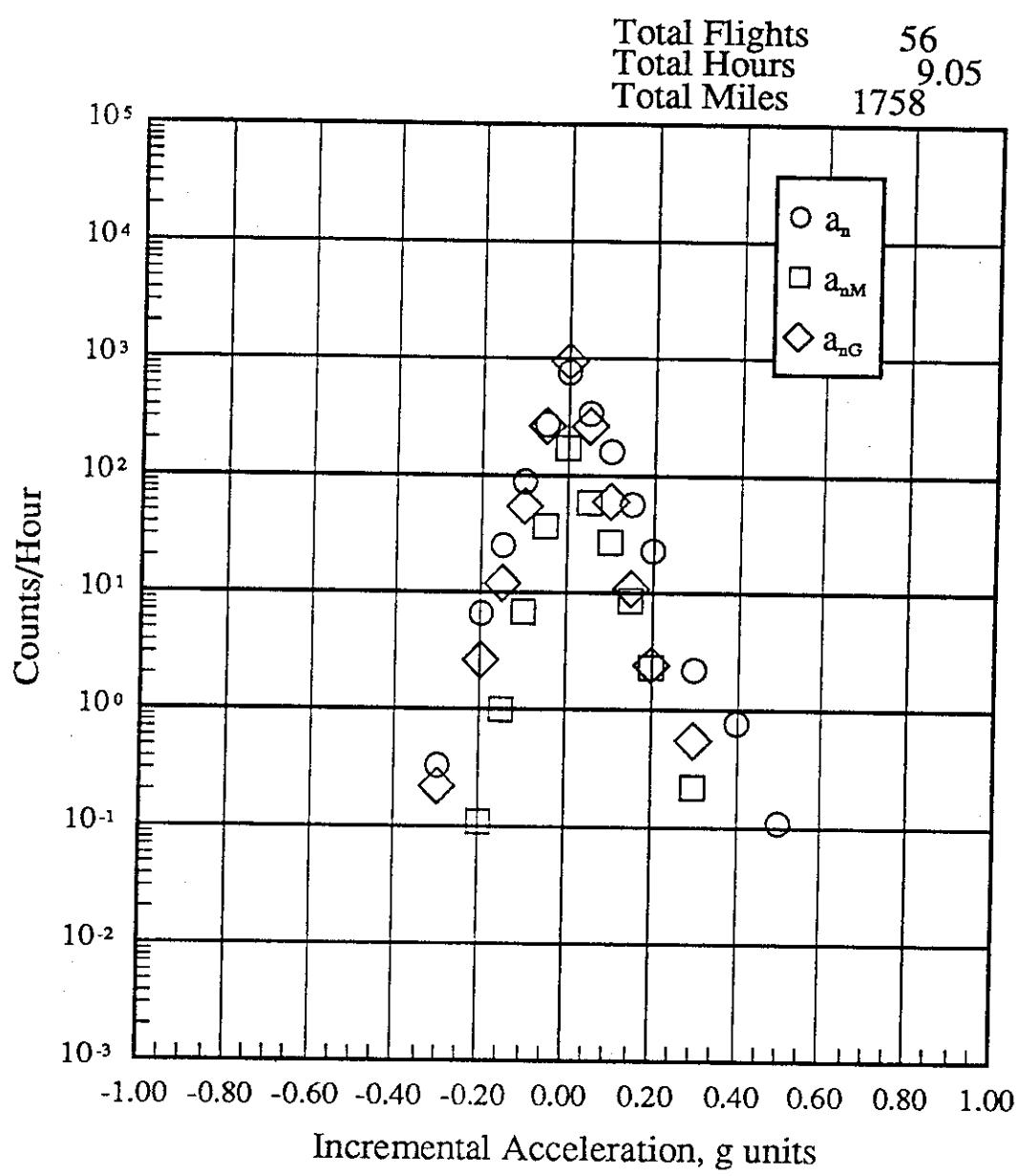
Figure 22.- Continued.

PRESSURE ALTITUDE BANDS

$a_n$	LEVEL	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
$g' \cdot s$											
1.60	0	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0	0
.50	0.11	0	0	0	0	0	0	0	0	0	0.04
.40	0.77	0	0.45	0.52	0	0	0	0	0	0	0.38
.30	2.21	1.92	1.79	1.03	2.50	0	0	0	0	0	1.48
.20	22.76	9.59	11.16	2.58	9.99	0	4.73	0	0	0	11.89
.15	57.00	20.56	27.23	5.16	27.48	0	9.45	1.38	0	0	29.27
.10	159.96	74.29	84.38	25.27	51.21	13.42	33.09	15.85	0	0	87.69
.05	335.94	130.22	226.36	95.92	146.15	148.56	115.01	101.68	12.42	0	205.29
0.00	752.41	1248.16	888.03	1006.10	954.34	1095.53	951.60	1489.98	696.26	0	976.33
-.05	272.09	111.85	144.66	81.48	178.63	98.72	143.37	117.19	14.49	0	170.87
-.10	88.93	33.72	45.09	17.02	27.48	5.75	17.33	14.13	0	0	48.17
-.15	25.08	8.50	12.50	2.88	2.50	0	3.15	1.72	0	0	12.65
-.20	6.63	3.56	5.36	1.55	1.25	0	1.58	0.34	0	0	3.84
-.30	0.33	0.27	1.34	0.52	0	0	1.58	0	0	0	0.38
-.40	0	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0	0
-.90	0	0	0	0	0	0	0	0	0	0	0
-.1.00	0	0	0	0	0	0	0	0	0	0	0
-.1.20	0	0	0	0	0	0	0	0	0	0	0
-.1.40	0	0	0	0	0	0	0	0	0	0	0
-.1.60	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS & ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71	
FLIGHT MILES & ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26	
TOTAL FLIGHTS											56
TOTAL FLIGHT HOURS											23.71
TOTAL FLIGHT MILES											7616.26

(a)  $a_n$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Normal acceleration exceedances: Non-revenue flights.



(d)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 4500 feet altitude

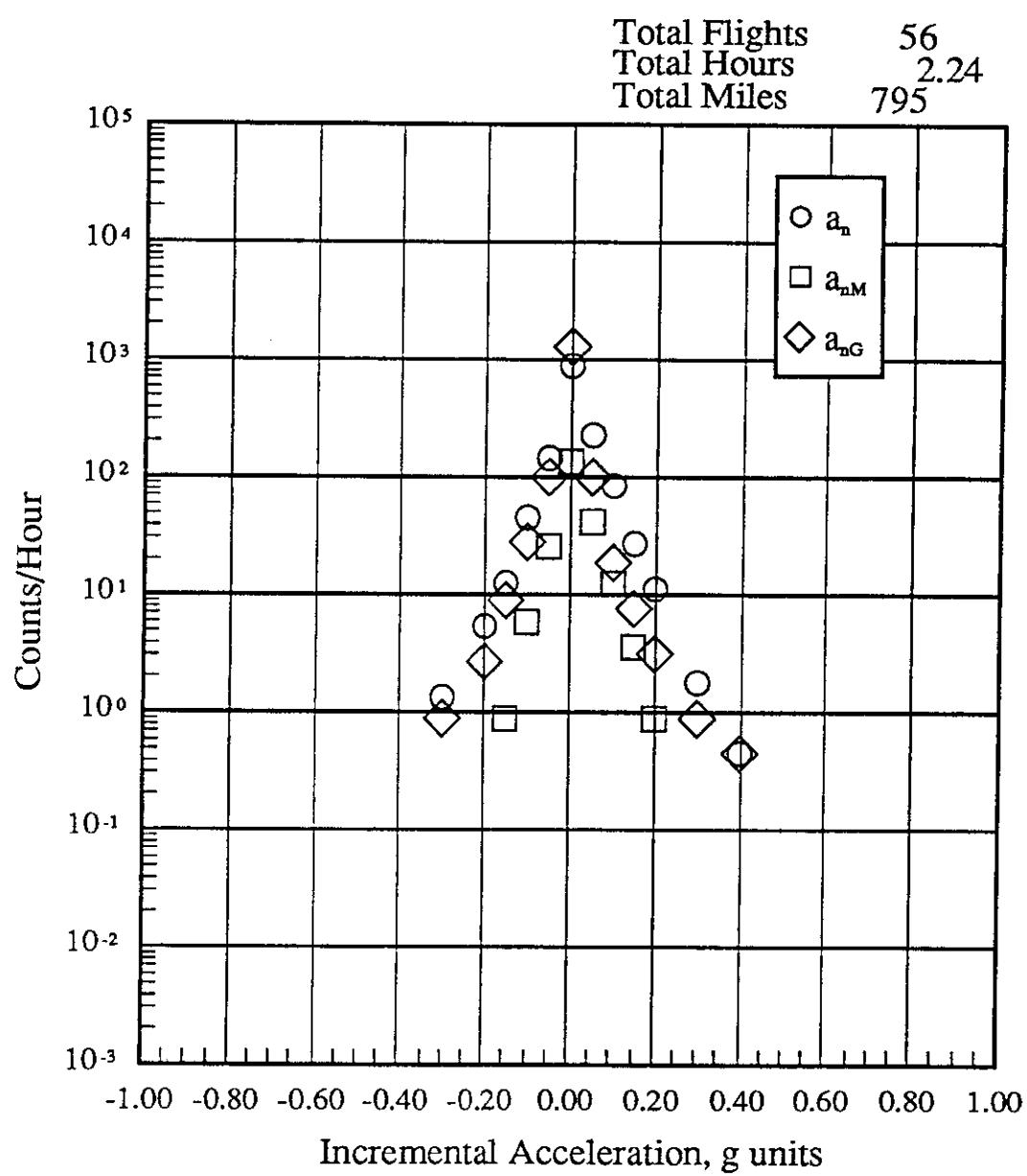
Figure 22.- Continued.

PRESSURE ALTITUDE BANDS

$a_{nG}$	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
LEVEL										
$g'/s$										
1.60	0	0	0	0	0	0	0	0	0	0
1.40	0	0	0	0	0	0	0	0	0	0
1.20	0	0	0	0	0	0	0	0	0	0
1.00	0	0	0	0	0	0	0	0	0	0
.80	0	0	0	0	0	0	0	0	0	0
.70	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	0	0	0	0	0	0
.50	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.30	0.55	0	0.89	0.52	0	0	0	0	0	0.34
.20	2.43	3.02	3.13	0.52	0	0	3.15	0	0	1.81
.15	10.83	4.11	7.59	1.03	1.25	0	4.73	1.03	0	5.86
.10	60.32	13.16	18.75	5.16	9.99	2.88	14.18	4.48	0	28.64
.05	262.92	69.91	99.56	29.39	68.70	23.00	40.96	55.84	0	134.22
0.00	938.44	1256.66	1288.96	1466.61	1366.55	1478.91	1350.20	1416.56	1419.44	1200.90
-.05	263.47	67.44	100.01	28.36	81.19	24.92	39.39	53.77	0.69	134.26
-.10	54.57	13.98	28.13	3.61	8.74	2.88	9.45	5.17	0	27.25
-.15	11.93	6.03	8.93	1.03	1.25	0	4.73	0.34	0	6.62
-.20	2.65	1.10	2.68	0.52	0	0	0	0	0	1.48
-.30	0.22	0	0.89	0.52	0	0	0	0	0	0.21
-.40	0	0	0	0	0	0	0	0	0	0
-.50	0	0	0	0	0	0	0	0	0	0
-.60	0	0	0	0	0	0	0	0	0	0
-.70	0	0	0	0	0	0	0	0	0	0
-.80	0	0	0	0	0	0	0	0	0	0
-.100	0	0	0	0	0	0	0	0	0	0
-.120	0	0	0	0	0	0	0	0	0	0
-.140	0	0	0	0	0	0	0	0	0	0
-.160	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26
TOTAL FLIGHTS									56	
TOTAL FLIGHT HOURS FLAPS UP AND DOWN									23.71	
TOTAL FLIGHT MILES FLAPS UP AND DOWN									7616.26	

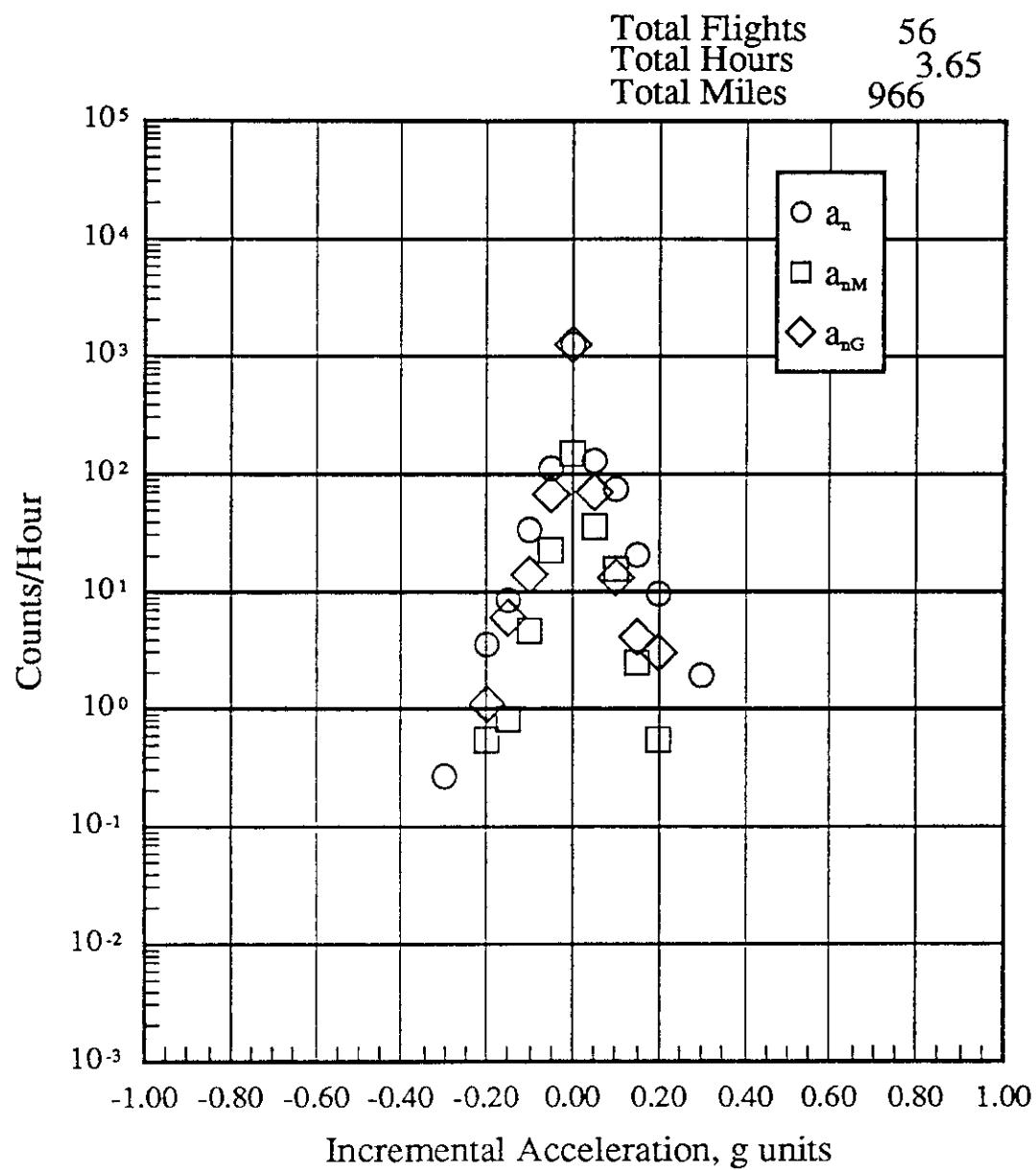
(c)  $a_{nG}$  Level crossing counts per hour within pressure altitude bands

Figure 22.- Continued.



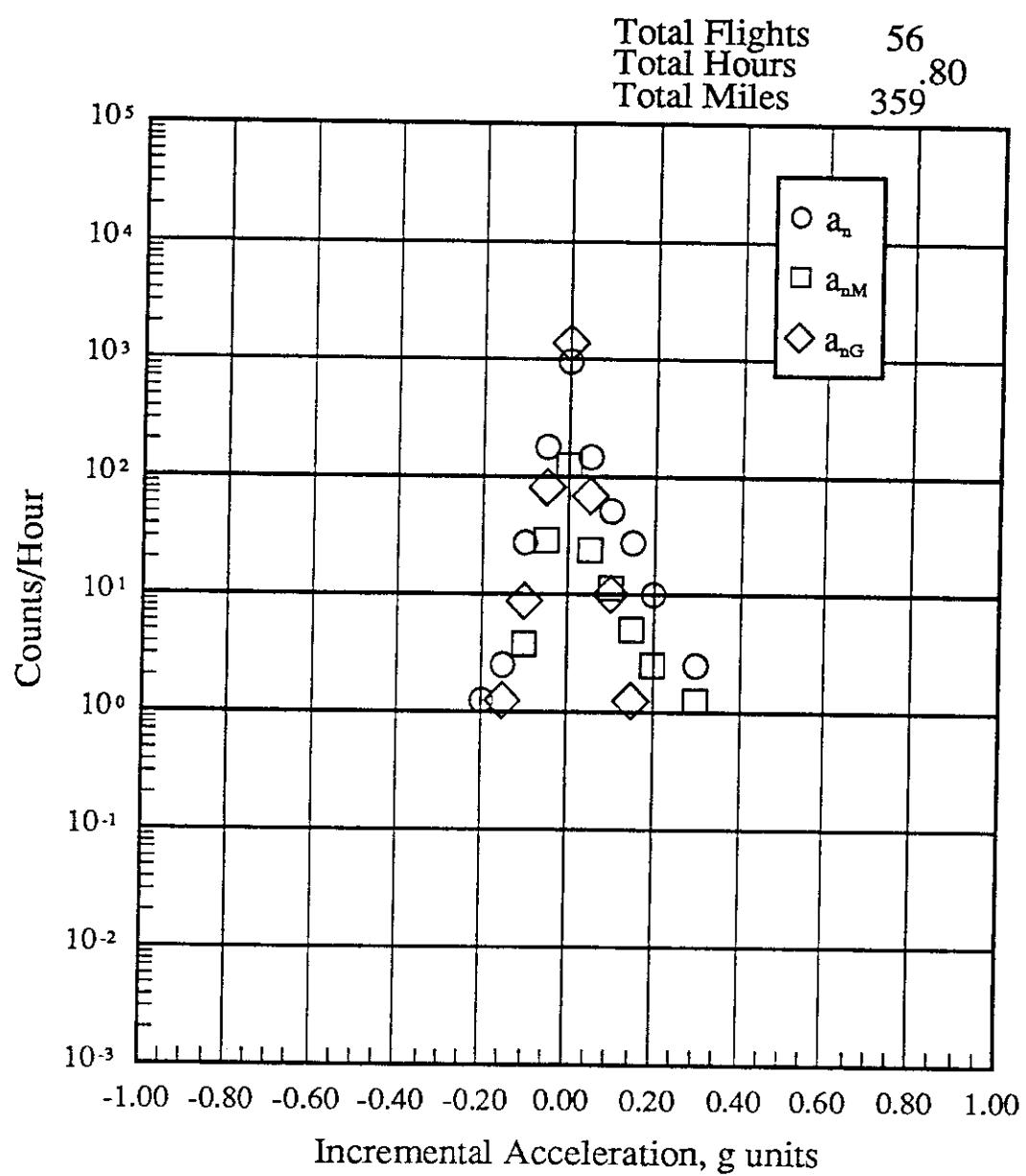
(f)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 9500 to 14500 feet altitude

Figure 22.- Continued.



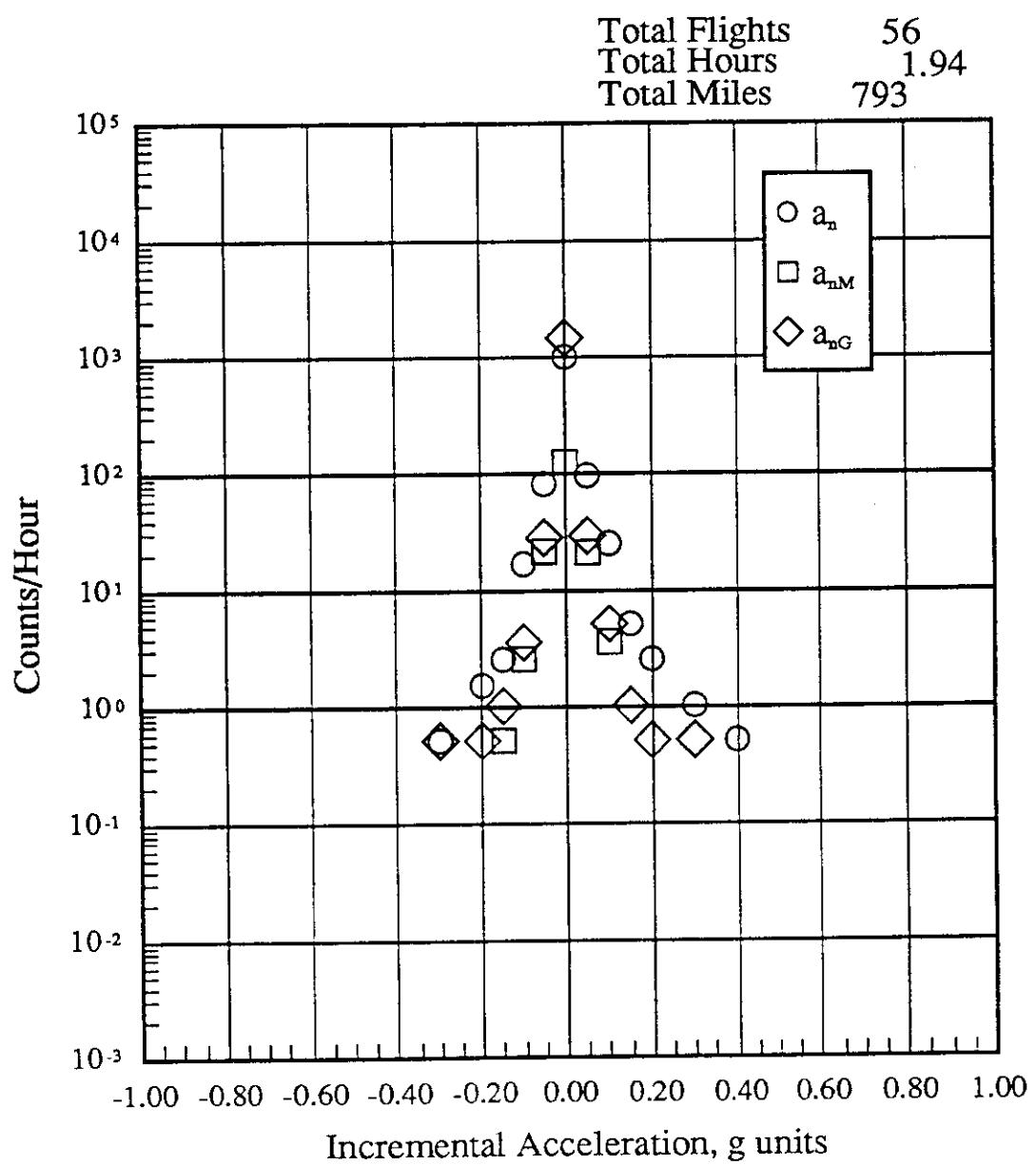
(e)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 4500 to 9500 feet altitude

Figure 22.- Continued.



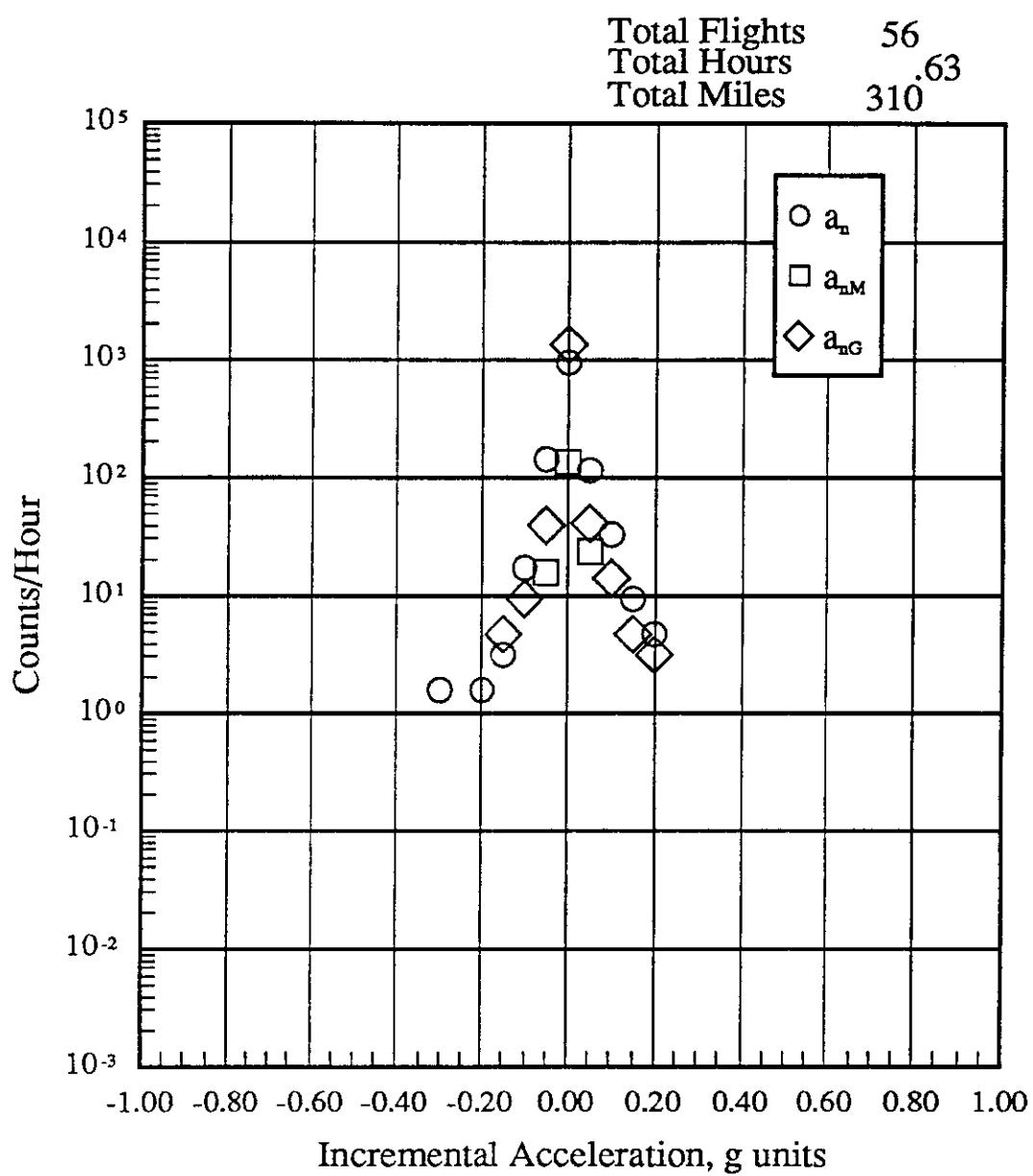
(h)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 19500 to 24500 feet altitude

Figure 22.- Continued.



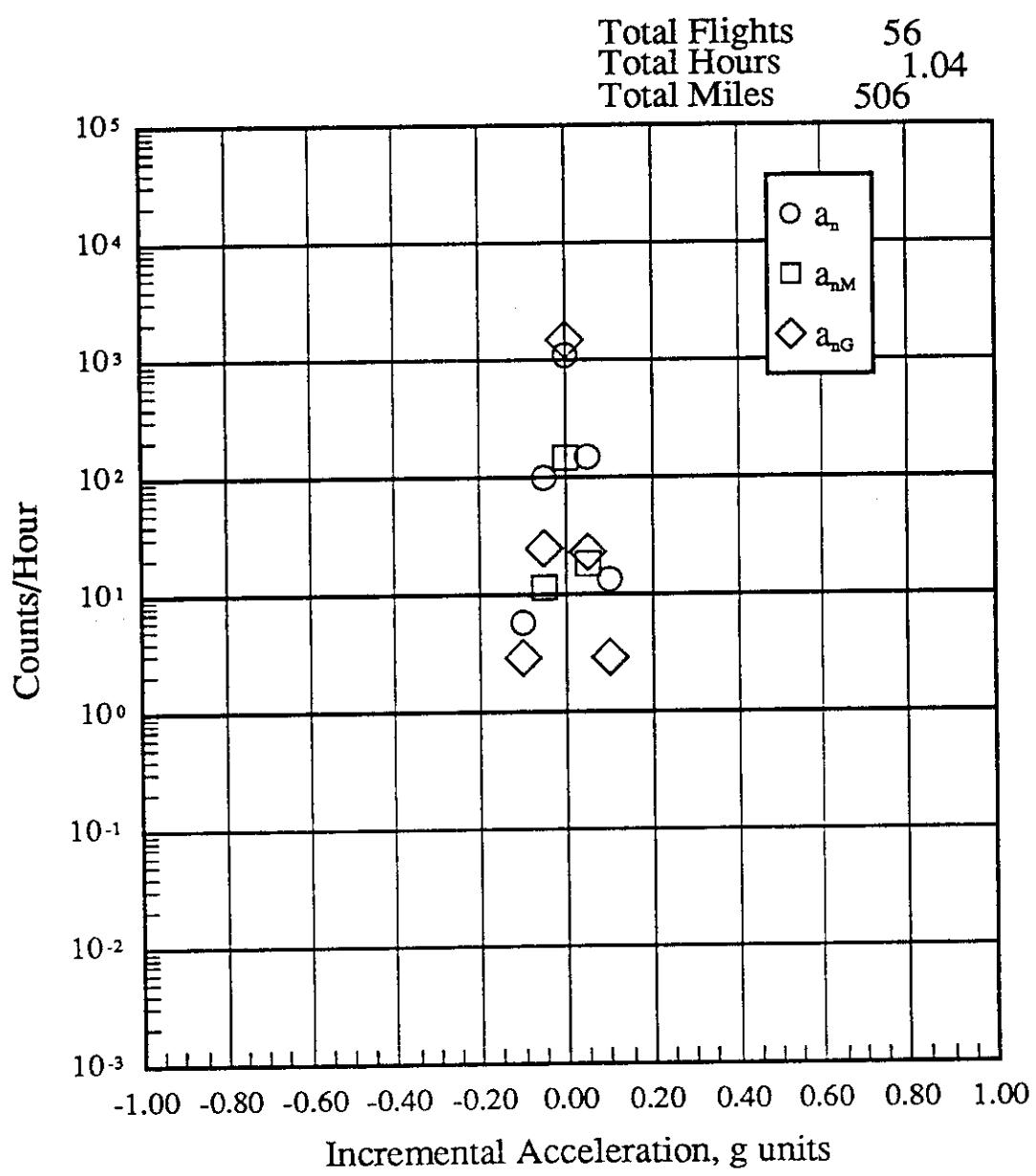
(g)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 14500 to 19500 feet altitude

Figure 22.- Continued.



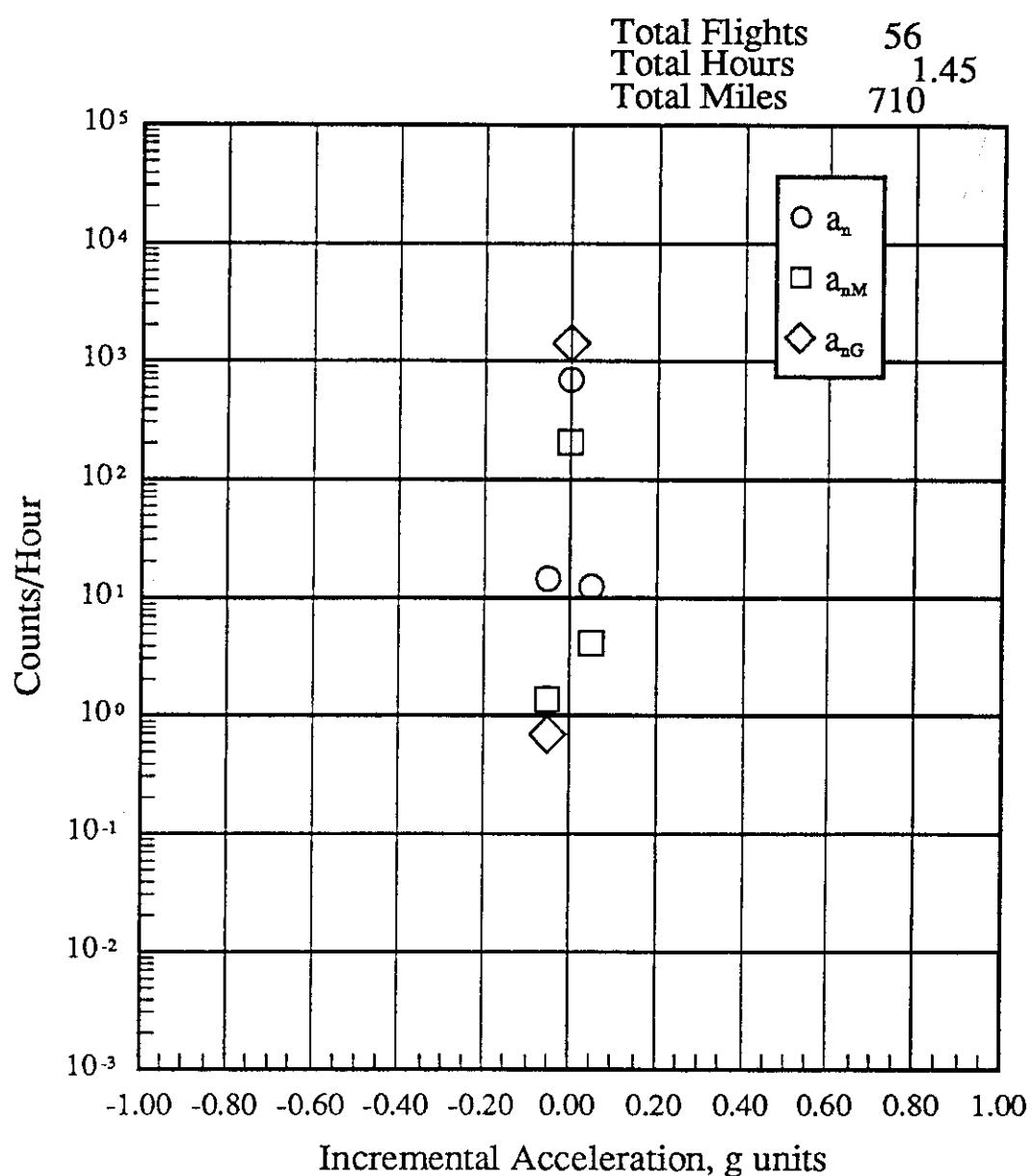
(j)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 29500 to 34500 feet altitude

Figure 22.- Continued.



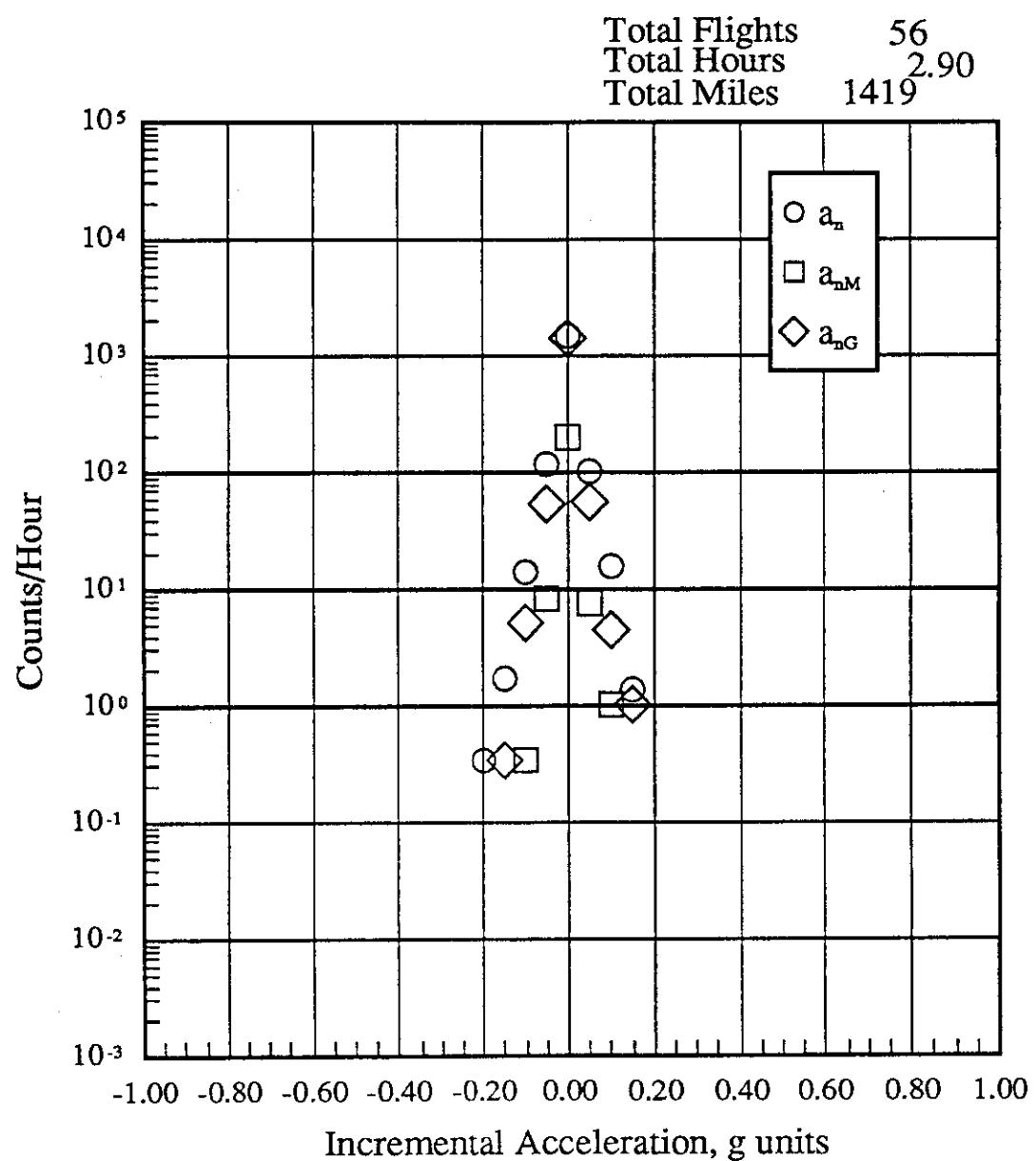
(i)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 24500 to 29500 feet altitude

Figure 22.- Continued.



(I)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 39500 to 44500 feet altitude

Figure 22.- Continued.



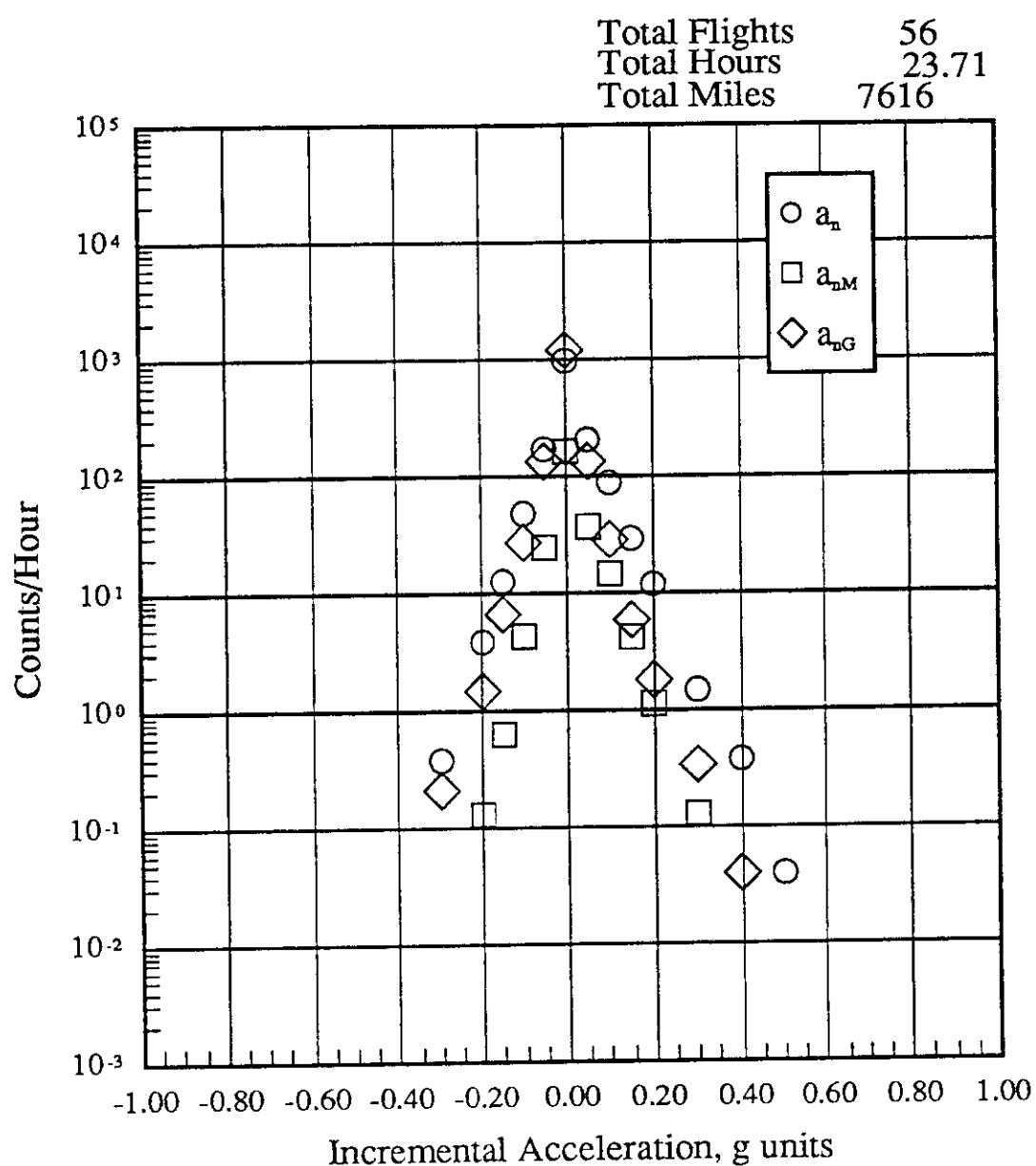
(k)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , 34500 to 39500 feet altitude

Figure 22.- Continued.

$a_y$ LEVEL g/s	PRESSURE ALTITUDE BAND									
	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
.48	0	0	0	0	0	0	0	0	0	0
.44	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.36	0	0	0	0	0	0	0	0	0	0
.32	0	0	0	0	0	0	0	0	0	0
.28	0	0	0	0	0	0	0	0	0	0
.24	0	0	0	0	0	0	0	0	0	0
.20	0	0	0	0	0	0	0	0	0	0
.16	0	0	0	0	0	0	0	0	0	0
.12	0	0	0	0	1.03	0	0	0	0	0.08
.08	1.88	1.10	0.45	3.61	0	0	0	0	0	1.22
.06	8.40	2.47	3.13	1.55	1.25	0	0	0	0	4.05
.04	57.33	13.98	22.32	2.58	16.24	0	3.15	2.76	0	27.33
.02	236.07	82.79	92.87	70.65	156.14	110.22	40.96	39.64	0	133.50
0	723.69	710.30	792.04	885.95	783.21	923.00	819.26	1419.66	1126.16	864.47
-.02	260.27	100.61	163.41	47.96	78.70	46.01	39.39	40.67	0	144.93
-.04	40.65	18.09	12.95	1.55	6.25	0.96	9.45	2.41	0	20.46
-.06	8.73	2.47	2.68	1.03	0	0	1.58	0	0	4.09
-.08	1.77	0.27	0.45	0	0	0	0	0	0	0.76
-.12	0.55	0	0	0	0	0	0	0	0	0.21
-.16	0	0	0	0	0	0	0	0	0	0
-.20	0	0	0	0	0	0	0	0	0	0
-.24	0	0	0	0	0	0	0	0	0	0
-.28	0	0	0	0	0	0	0	0	0	0
-.32	0	0	0	0	0	0	0	0	0	0
-.36	0	0	0	0	0	0	0	0	0	0
-.40	0	0	0	0	0	0	0	0	0	0
-.44	0	0	0	0	0	0	0	0	0	0
-.48	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26
TOTAL FLIGHTS									56	
TOTAL FLIGHT HOURS									23.71	
TOTAL FLIGHT MILES									7616.26	

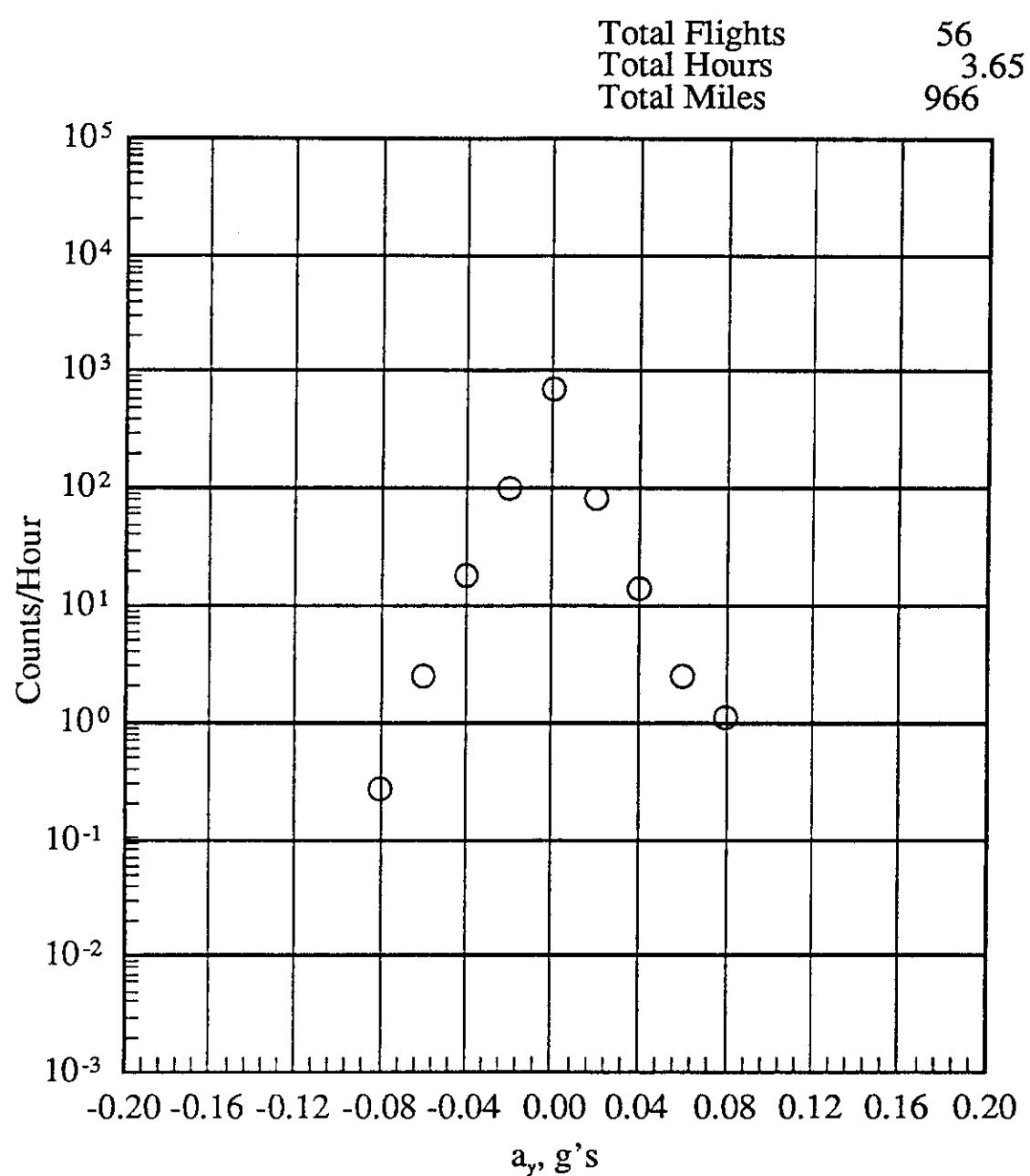
(a)  $a_y$  Level crossing counts per hour within pressure altitude bands

Figure 23.- Lateral acceleration exceedances: Nonrevenue flights.



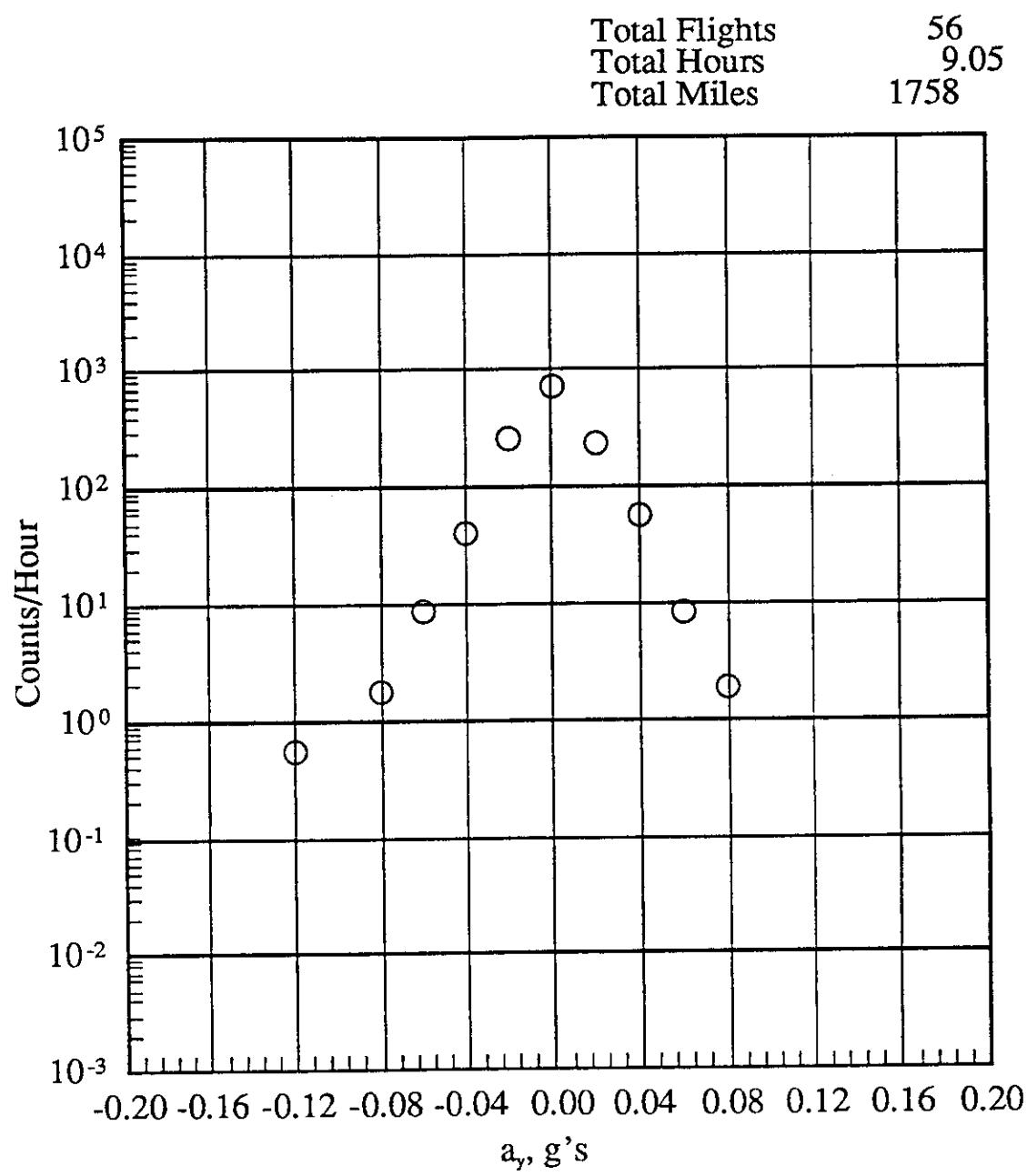
(m)  $a_n$ ,  $a_{nM}$ ,  $a_{nG}$ , -500 to 44500 feet altitude

Figure 22.- Concluded.



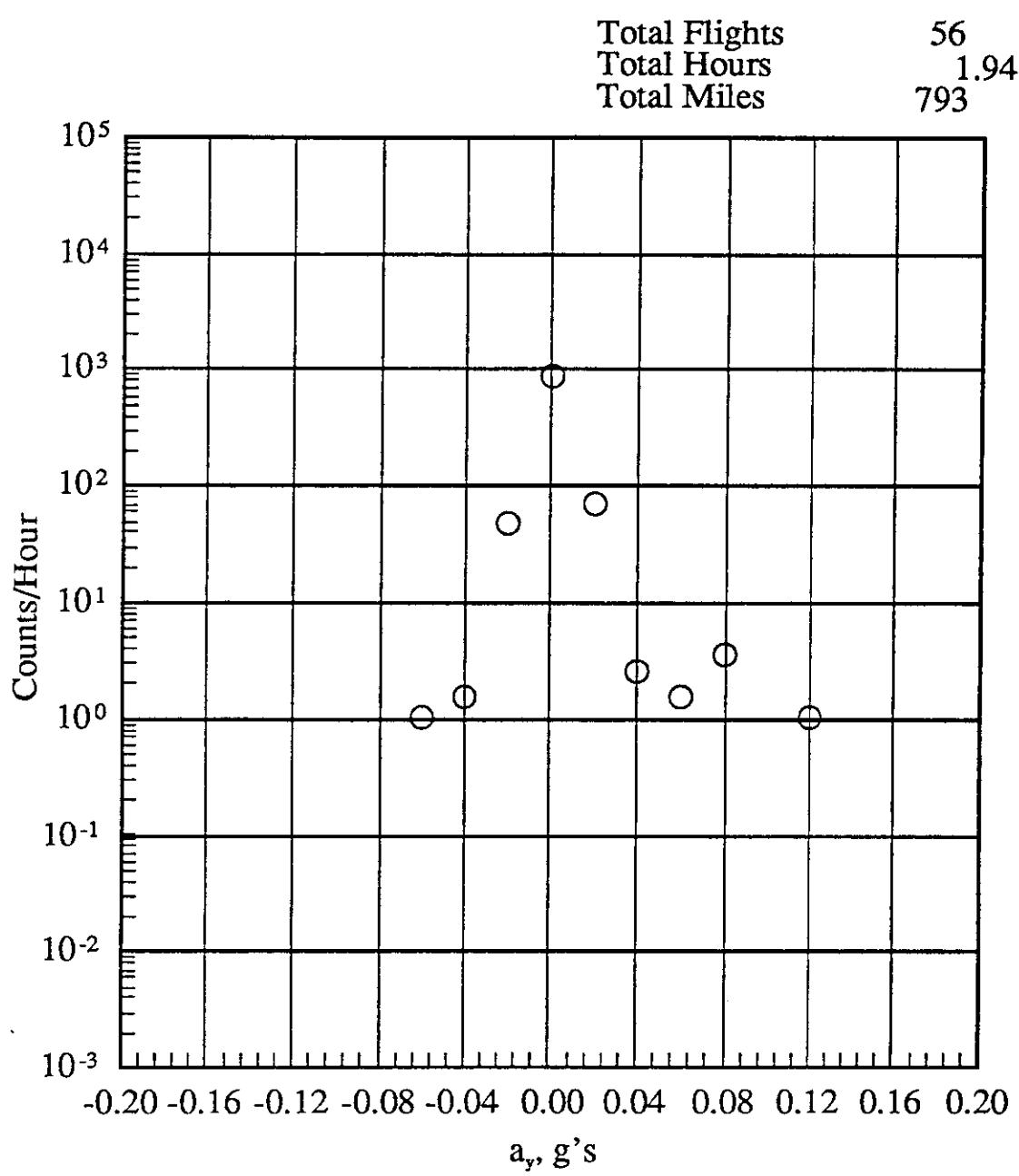
(c) 4500 to 9500 feet altitude

Figure 23.- Continued.



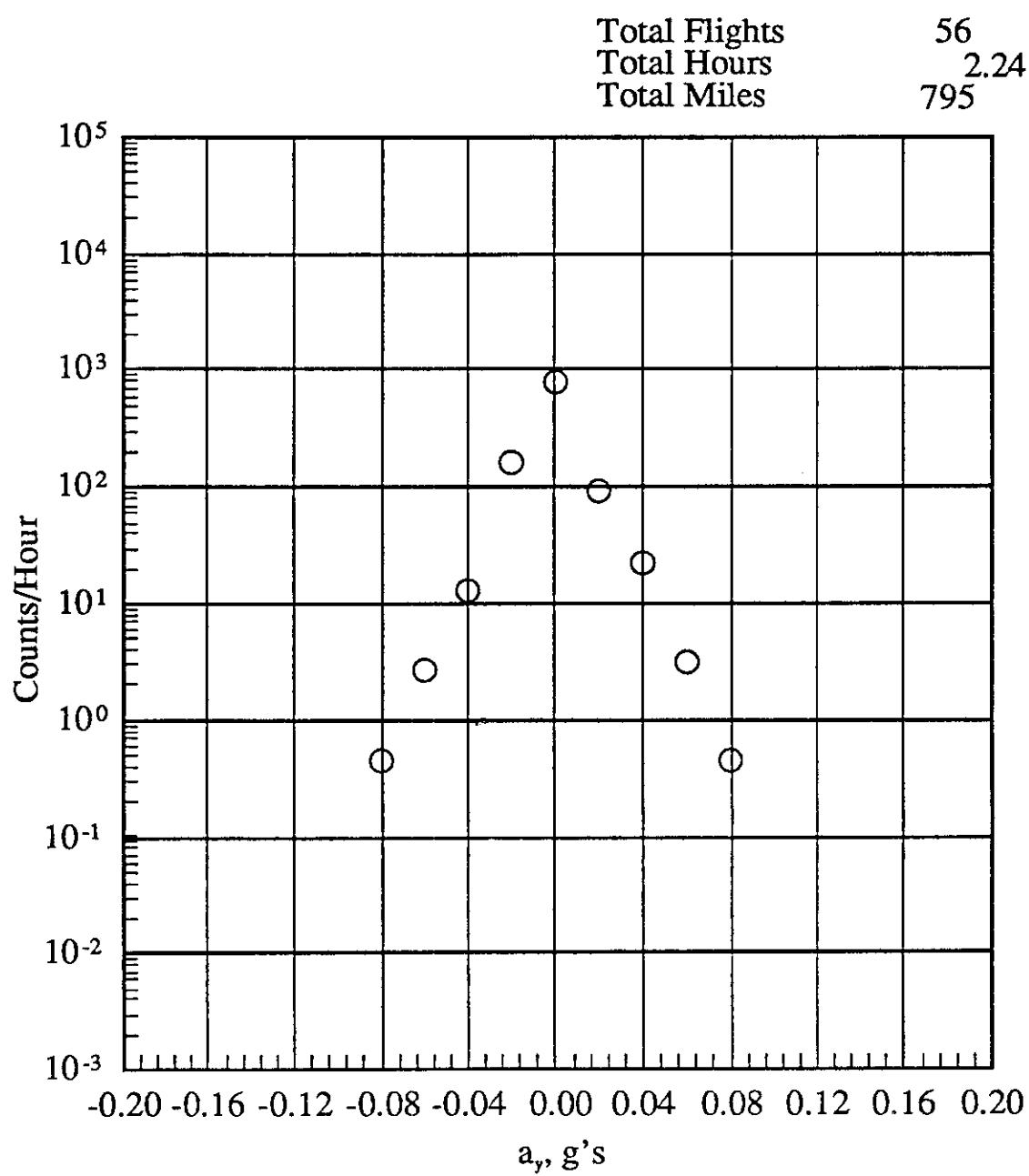
(b) -500 to 4500 feet altitude

Figure 23.- Continued.



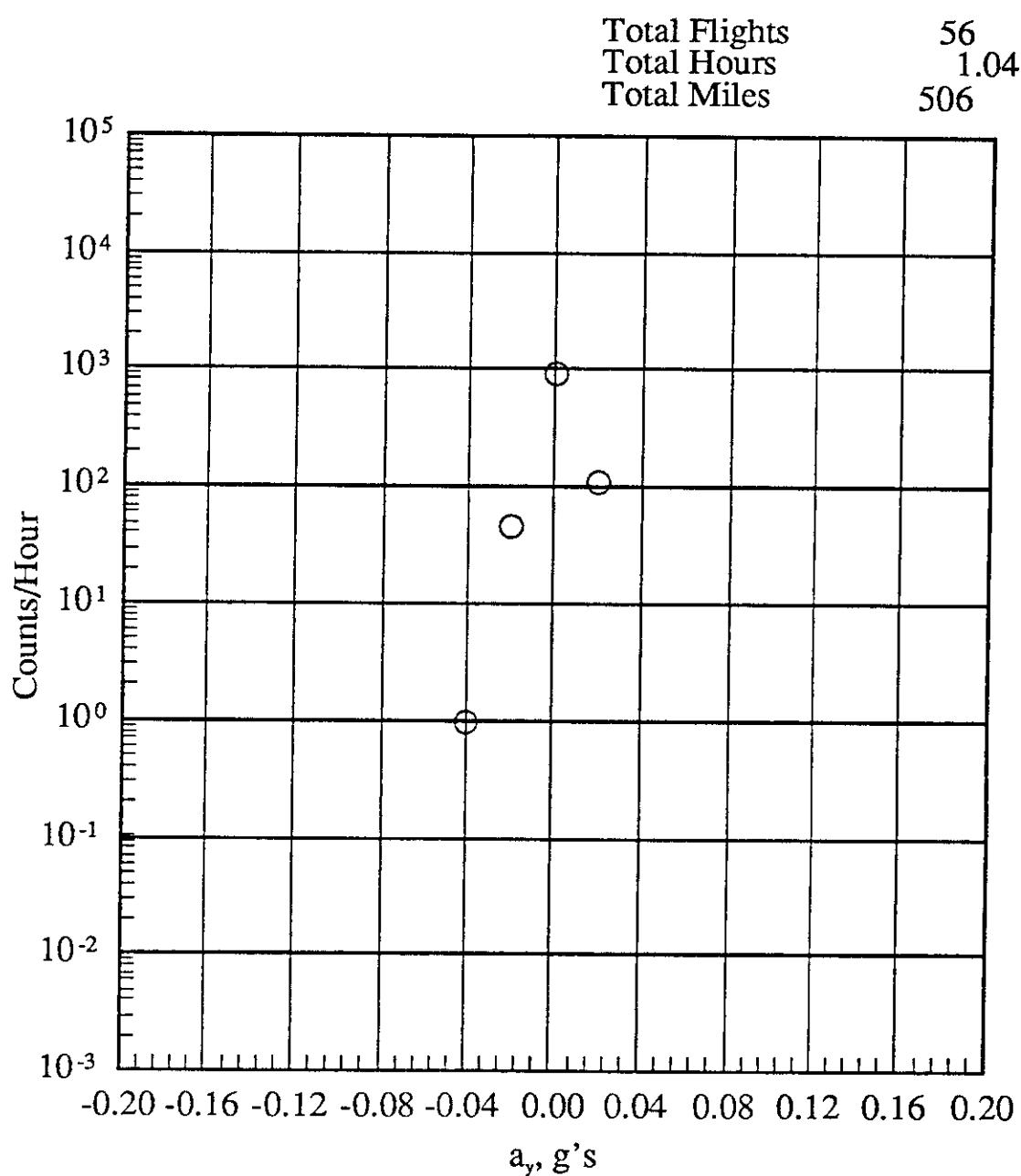
(e) 14500 to 19500 feet altitude

Figure 23.- Continued.



(d) 9500 to 14500 altitude

Figure 23.- Continued.



(g) 24500 to 29500 feet altitude

Figure 23.- Continued.

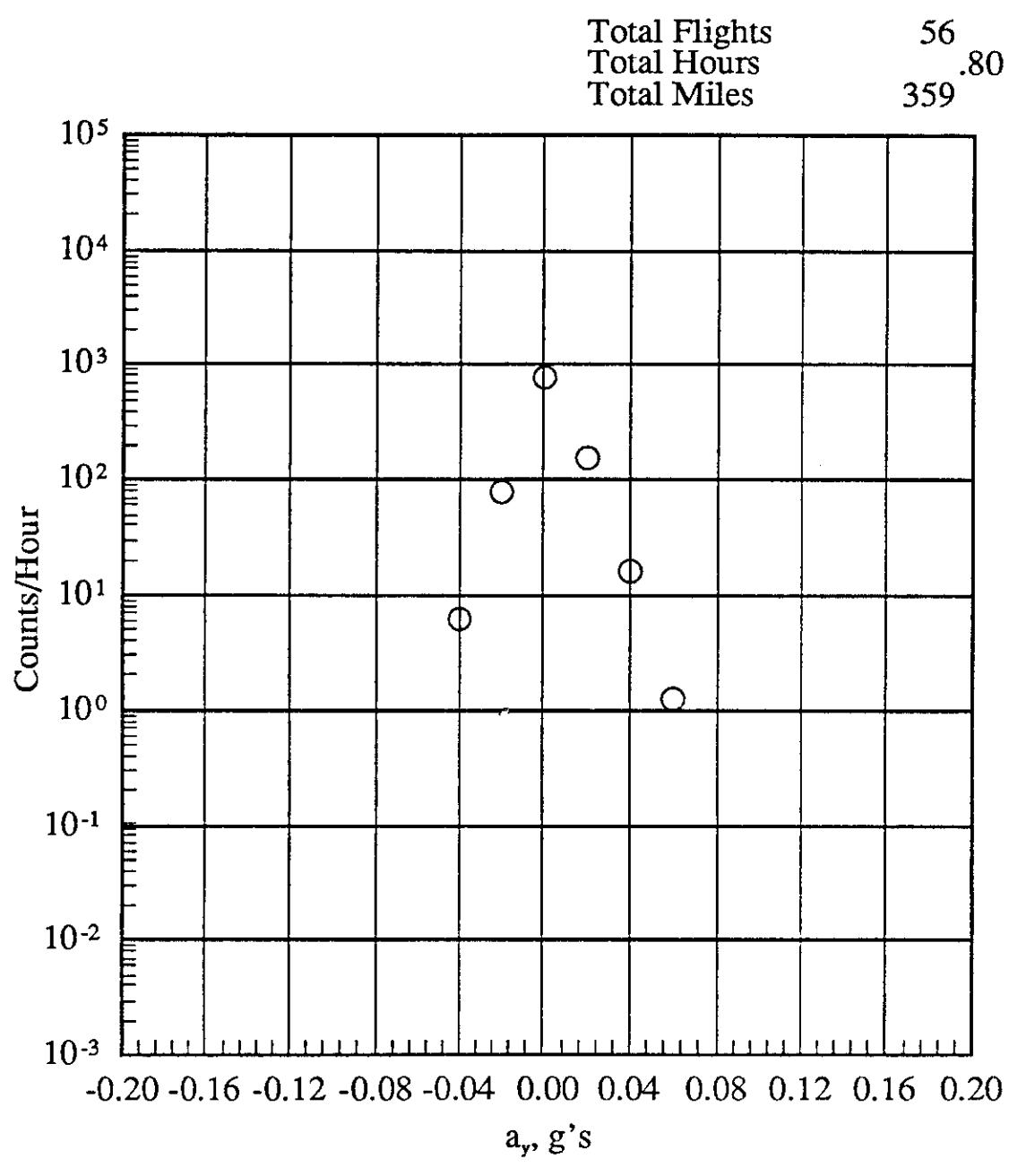
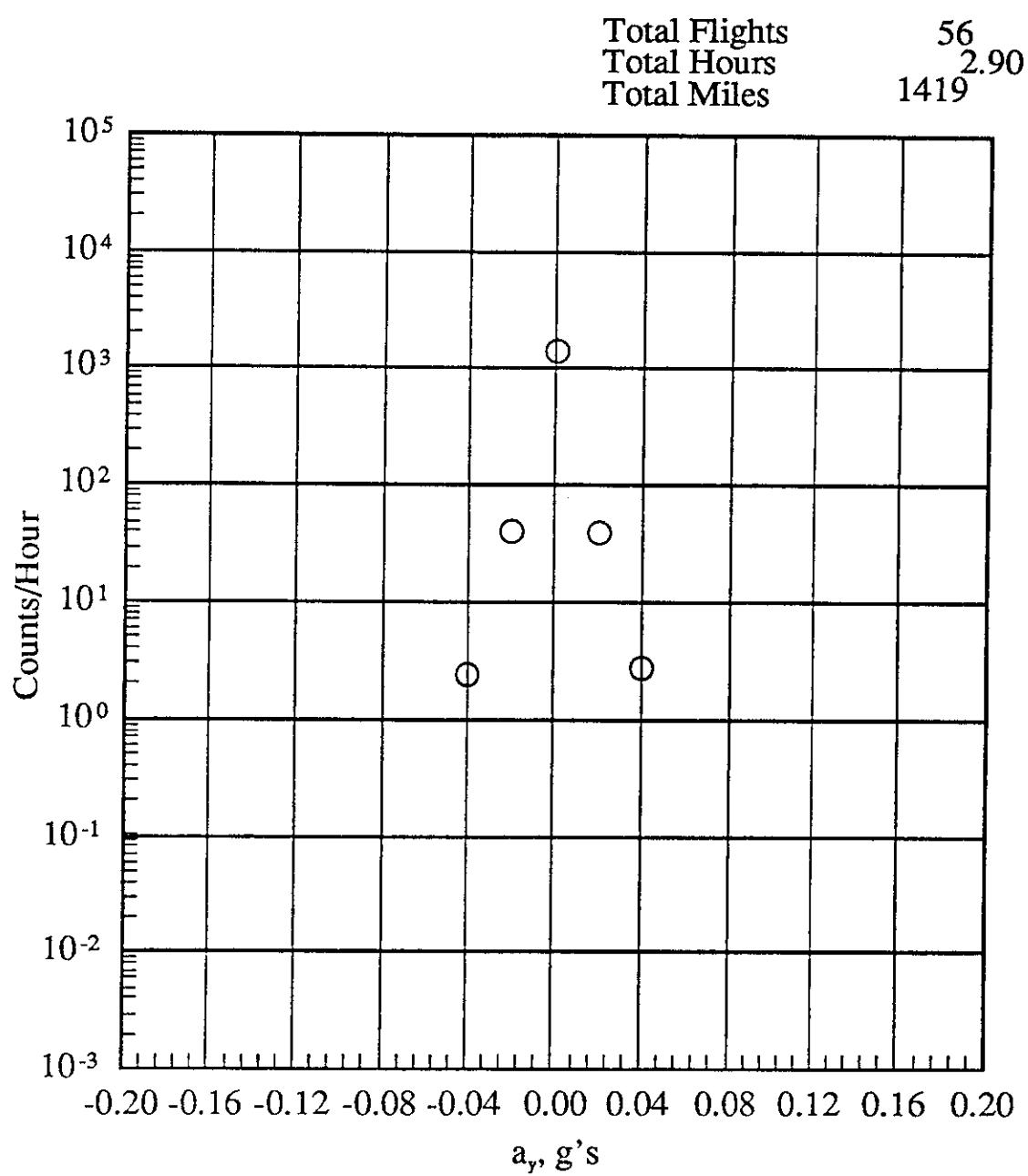
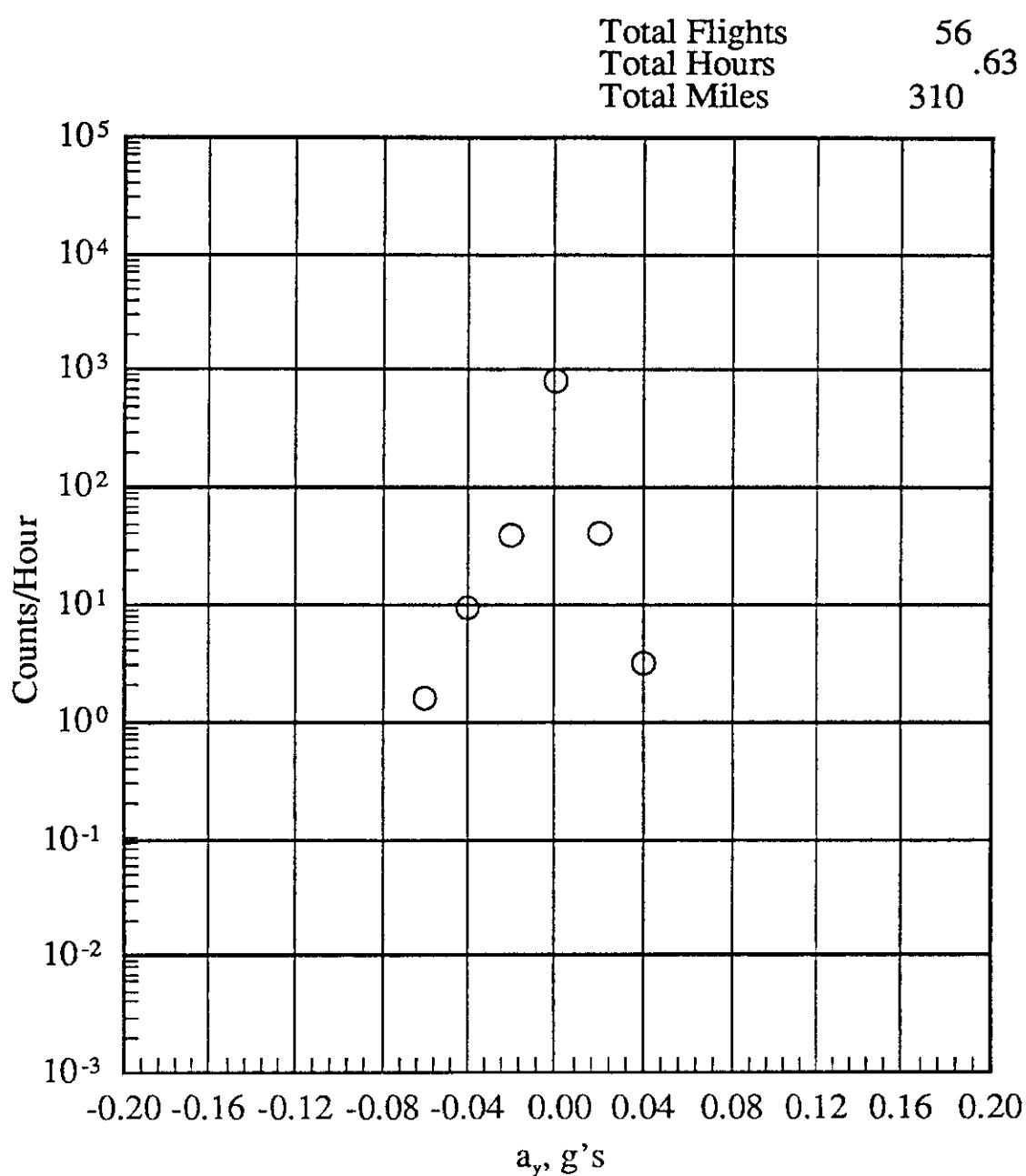


Figure 23.- Continued.



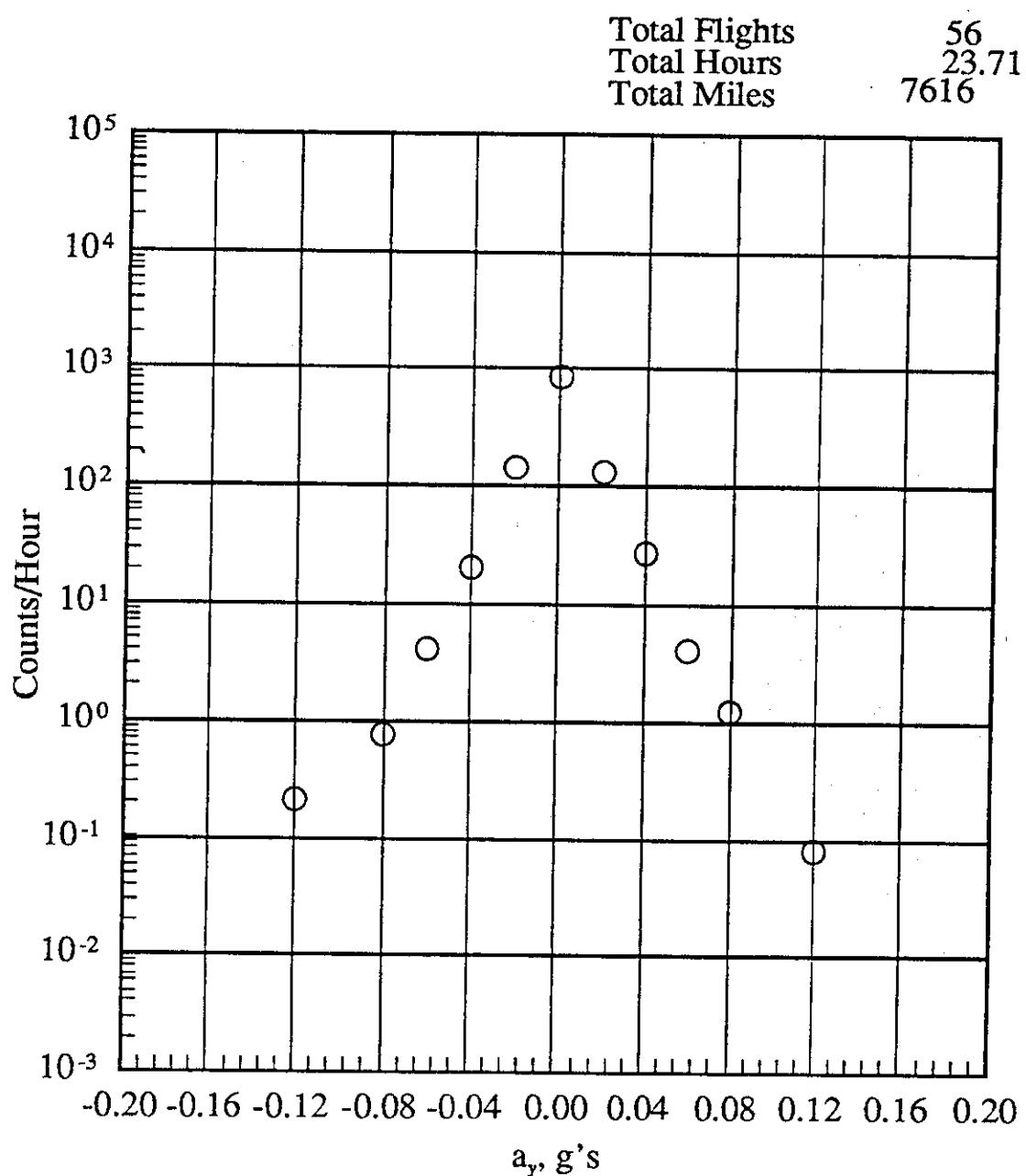
(i) 34500 to 39500 feet altitude

Figure 23.- Continued.



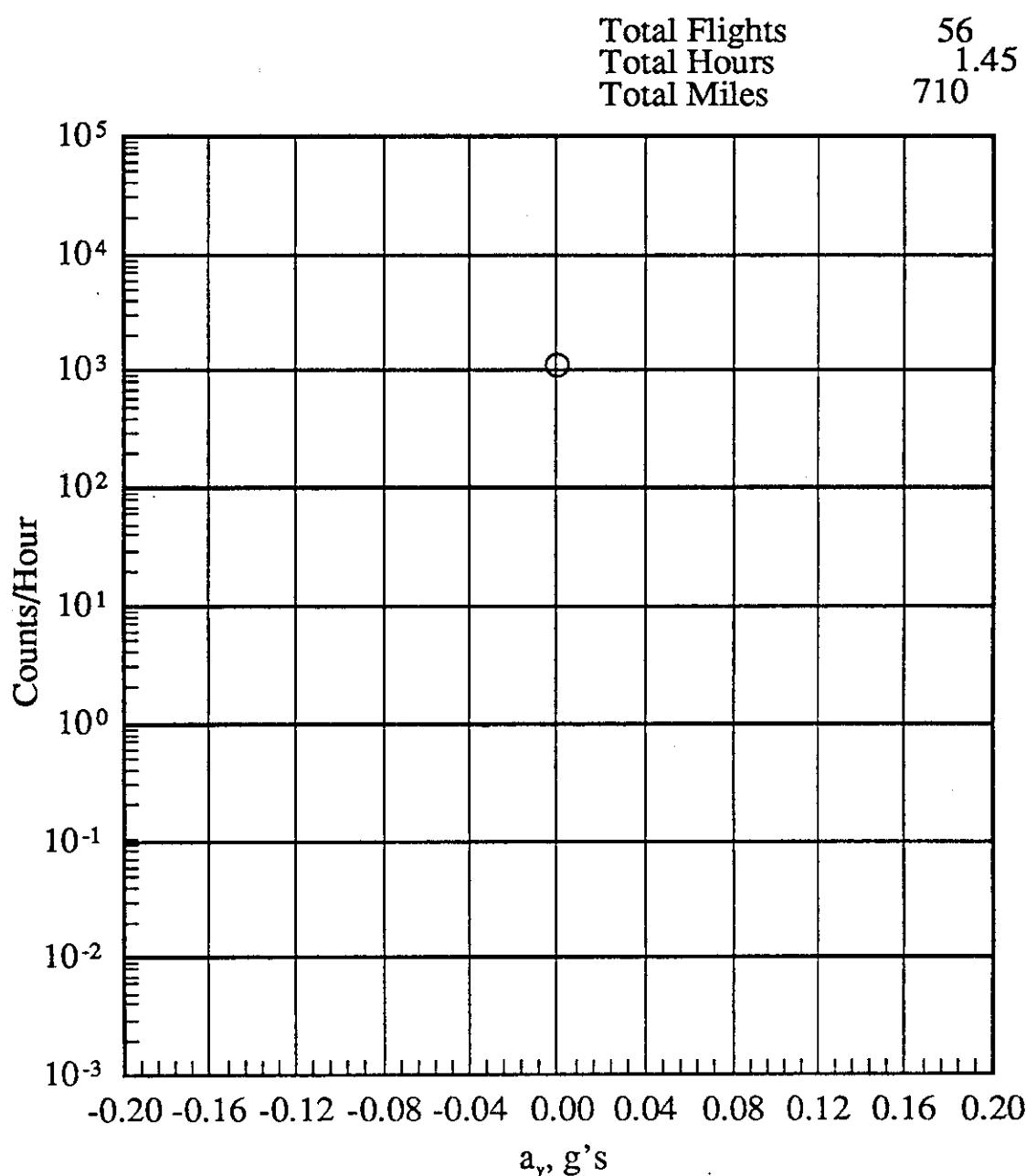
(h) 29500 to 34500 feet altitude

Figure 23.- Continued.



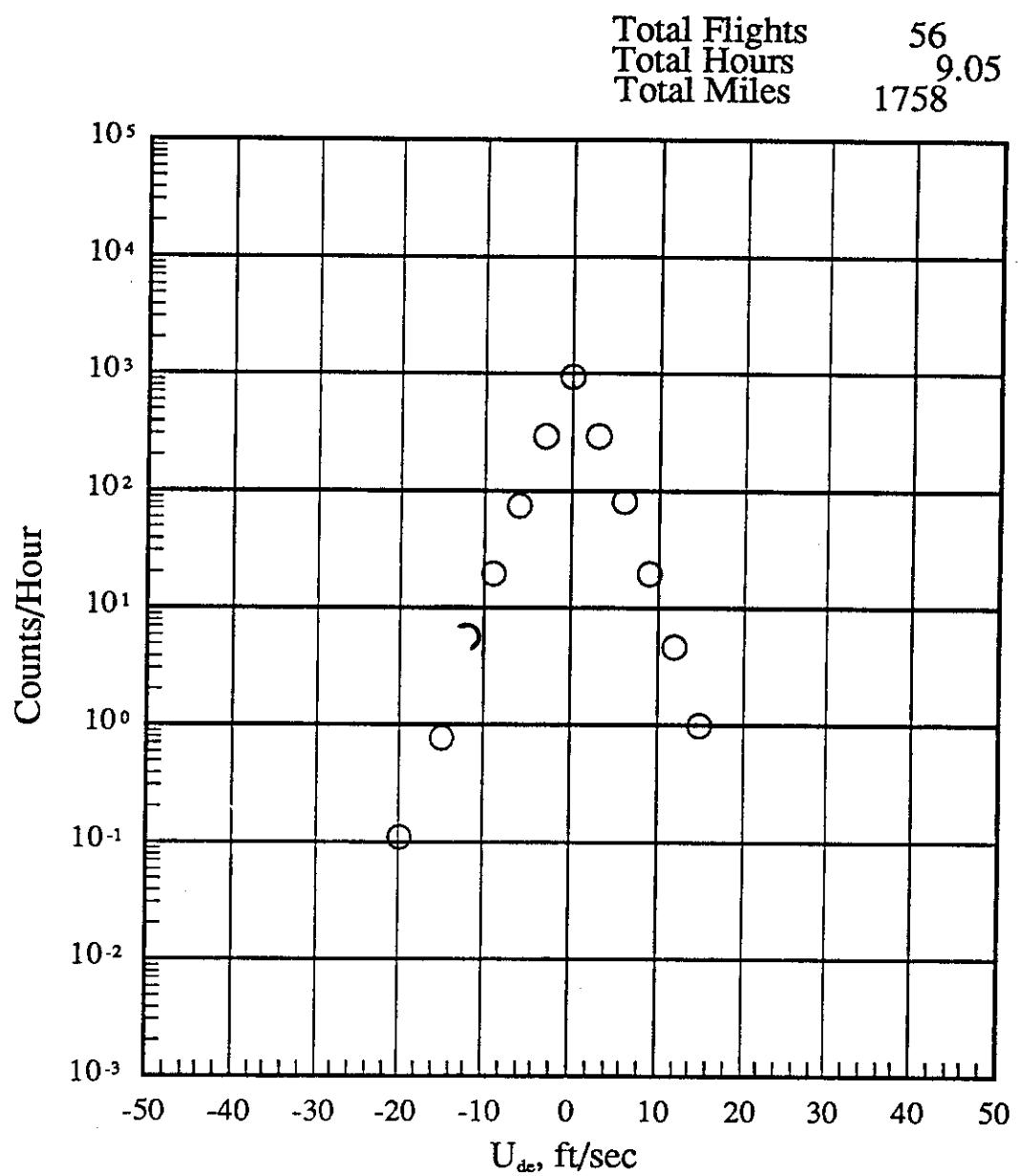
(k) -500 to 44500 feet altitude

Figure 23.- Concluded



(j) 39500 to 44500 feet altitude

Figure 23.- Continued.



(b) -500 to 4500 feet altitude

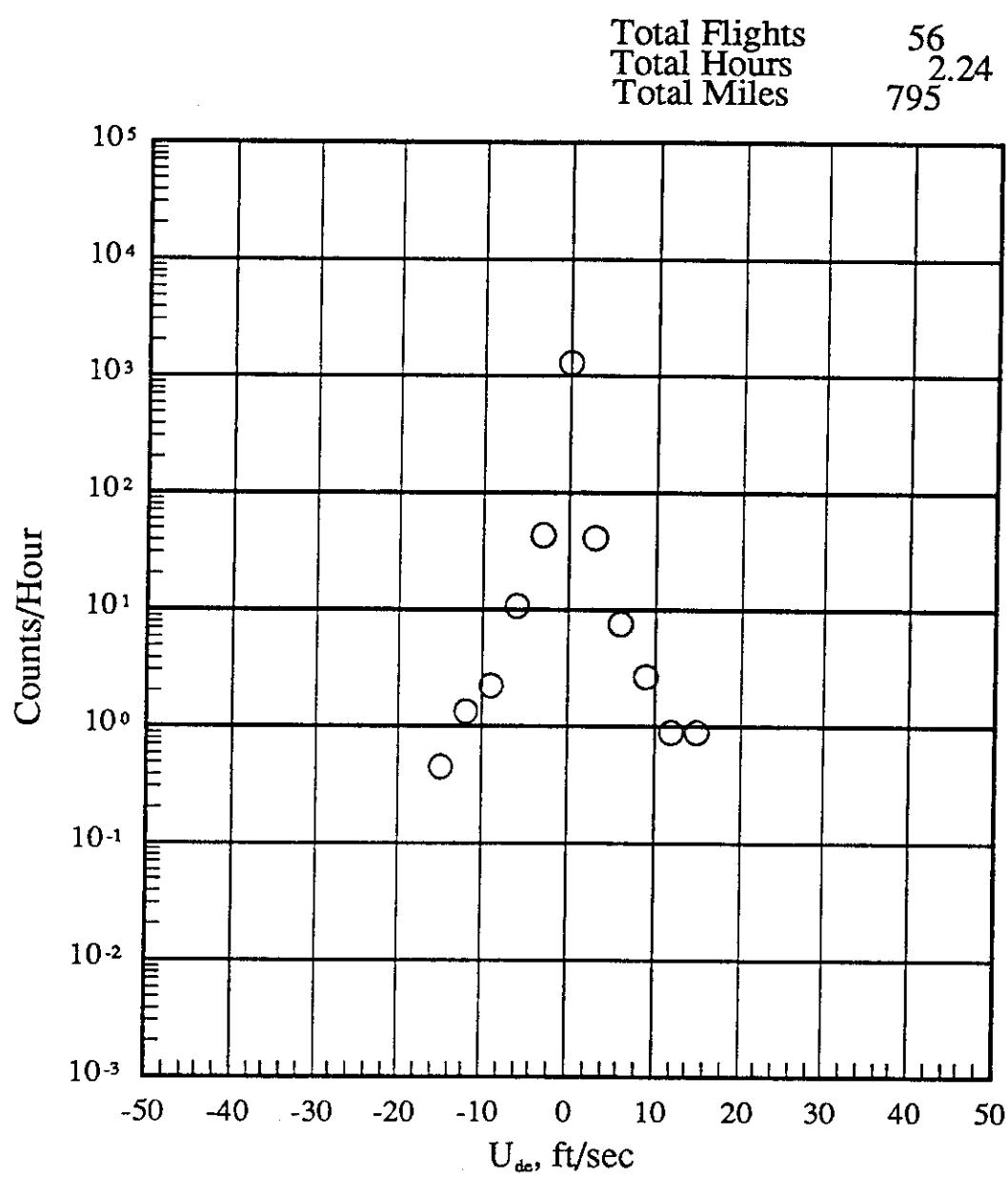
Figure 24.- Continued.

PRESSURE ALTITUDE BAND

$U_{de}$	DERIVED GUST VELOCITY LEVEL FT/SEC	-500 TO 4500 FT	4500 TO 9500 FT	9500 TO 14500 FT	14500 TO 19500 FT	19500 TO 24500 FT	24500 TO 29500 FT	29500 TO 34500 FT	34500 TO 39500 FT	39500 TO 44500 FT	-500 TO 44500 FT
100	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
15	0.99	0	0.89	0	0	0	0	0	0	0	0.46
12	4.64	0.27	0.89	0	0	0	0	0	0	0	1.90
9	19.55	3.02	2.68	0.52	0	0	0	0	0	0	8.23
6	80.75	7.40	7.59	1.03	0	0	3.15	1.03	0	0	32.98
3	293.08	41.94	40.63	7.74	12.49	4.79	15.75	6.55	0	0	124.68
0	938.44	1256.66	1288.96	1466.61	1366.55	1478.91	1350.20	1416.56	1419.44	1200.90	
-3	292.75	41.40	42.86	4.64	13.74	1.92	11.03	6.89	0	0	124.26
-6	74.35	8.22	10.72	0.52	0	0	0	0.34	0	0	30.75
-9	19.55	1.92	2.23	0.52	0	0	0	0	0	0	8.01
-12	5.63	0.27	1.34	0	0	0	0	0	0	0	2.32
-15	0.77	0	0.45	0	0	0	0	0	0	0	0.34
-20	0.11	0	0	0	0	0	0	0	0	0	0.04
-30	0	0	0	0	0	0	0	0	0	0	0
-40	0	0	0	0	0	0	0	0	0	0	0
-50	0	0	0	0	0	0	0	0	0	0	0
-60	0	0	0	0	0	0	0	0	0	0	0
-70	0	0	0	0	0	0	0	0	0	0	0
-80	0	0	0	0	0	0	0	0	0	0	0
-90	0	0	0	0	0	0	0	0	0	0	0
-100	0	0	0	0	0	0	0	0	0	0	0
FLIGHT HOURS @ ALT	9.05	3.65	2.24	1.94	0.80	1.04	0.63	2.90	1.45	23.71	
FLIGHT MILES @ ALT	1758.01	966.39	794.83	793.19	358.67	505.83	309.94	1419.36	710.03	7616.26	
TOTAL FLIGHTS									56		
TOTAL FLIGHT HOURS									23.71		
A											
TOTAL FLIGHT MILES									7616.26		
UP AND DOWN											

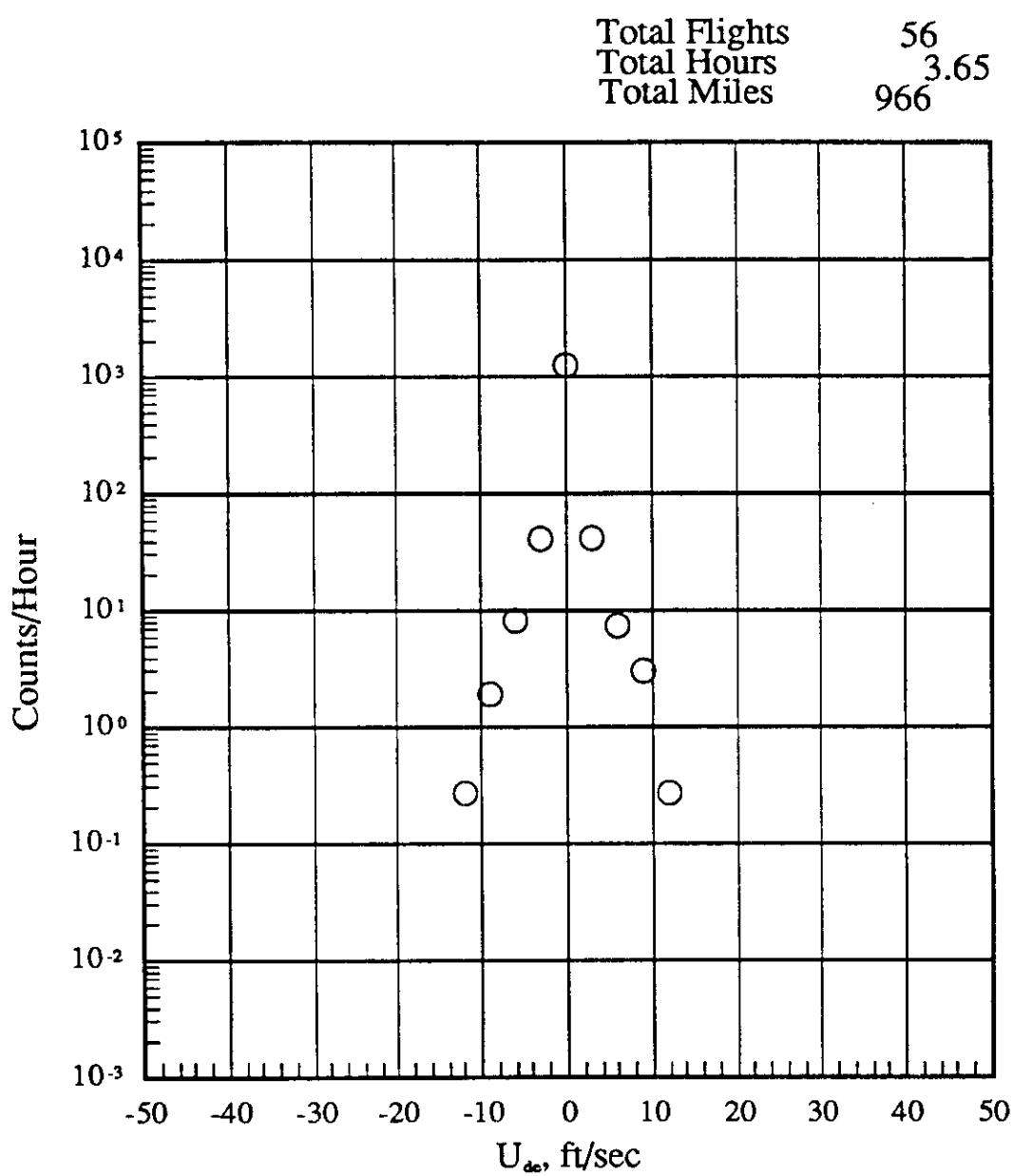
(a)  $U_{de}$  Level exceedances: Nonrevenue flights

Figure 24.-  $U_{de}$  exceedances: Nonrevenue flights.



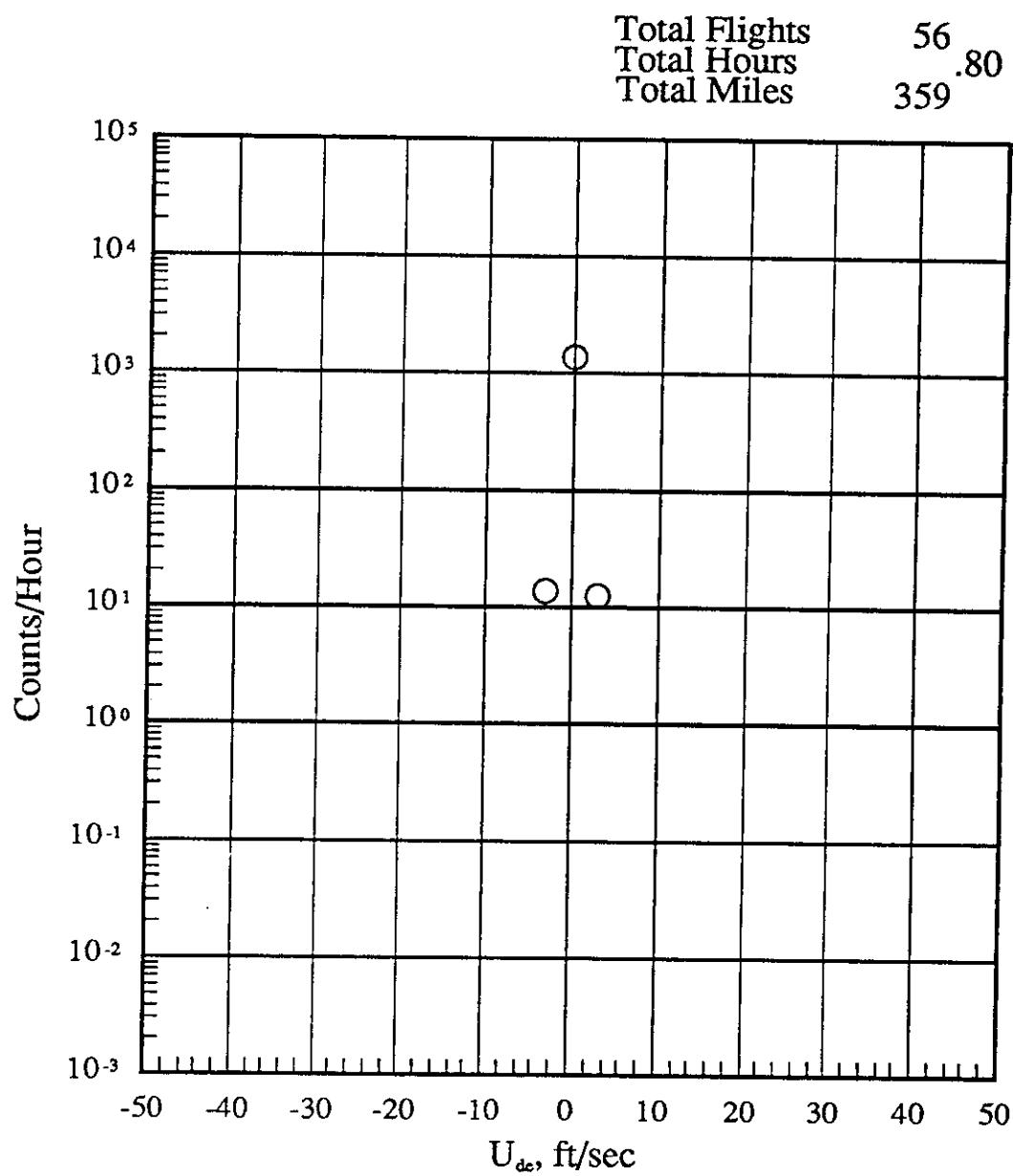
(d) 9500 to 14500 feet altitud

Figure 24.- Continued.



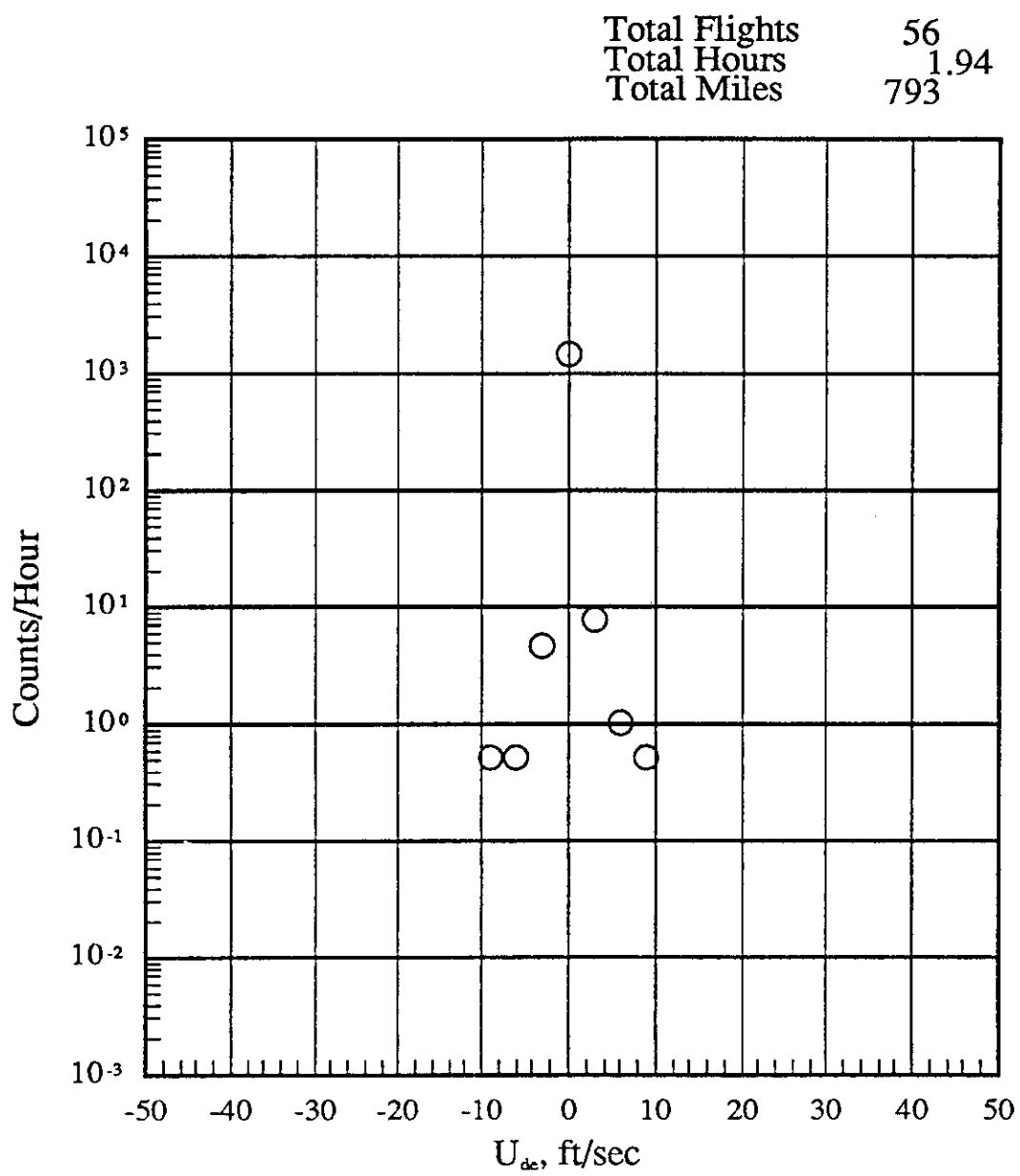
(c) 4500 to 9500 feet altitude

Figure 24.- Continued.



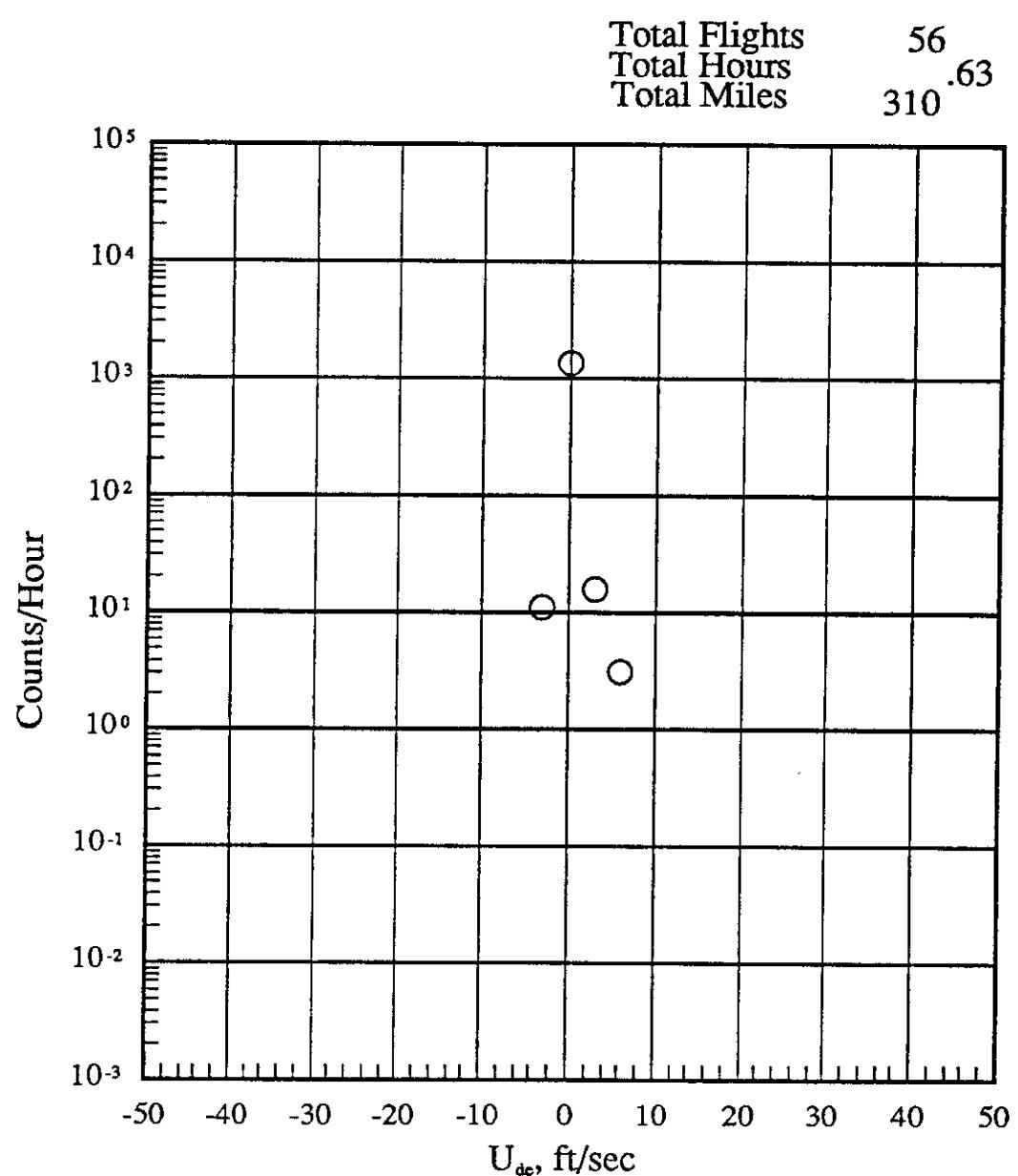
(f) 19500 to 24500 feet altitude

Figure 24.- Continued.



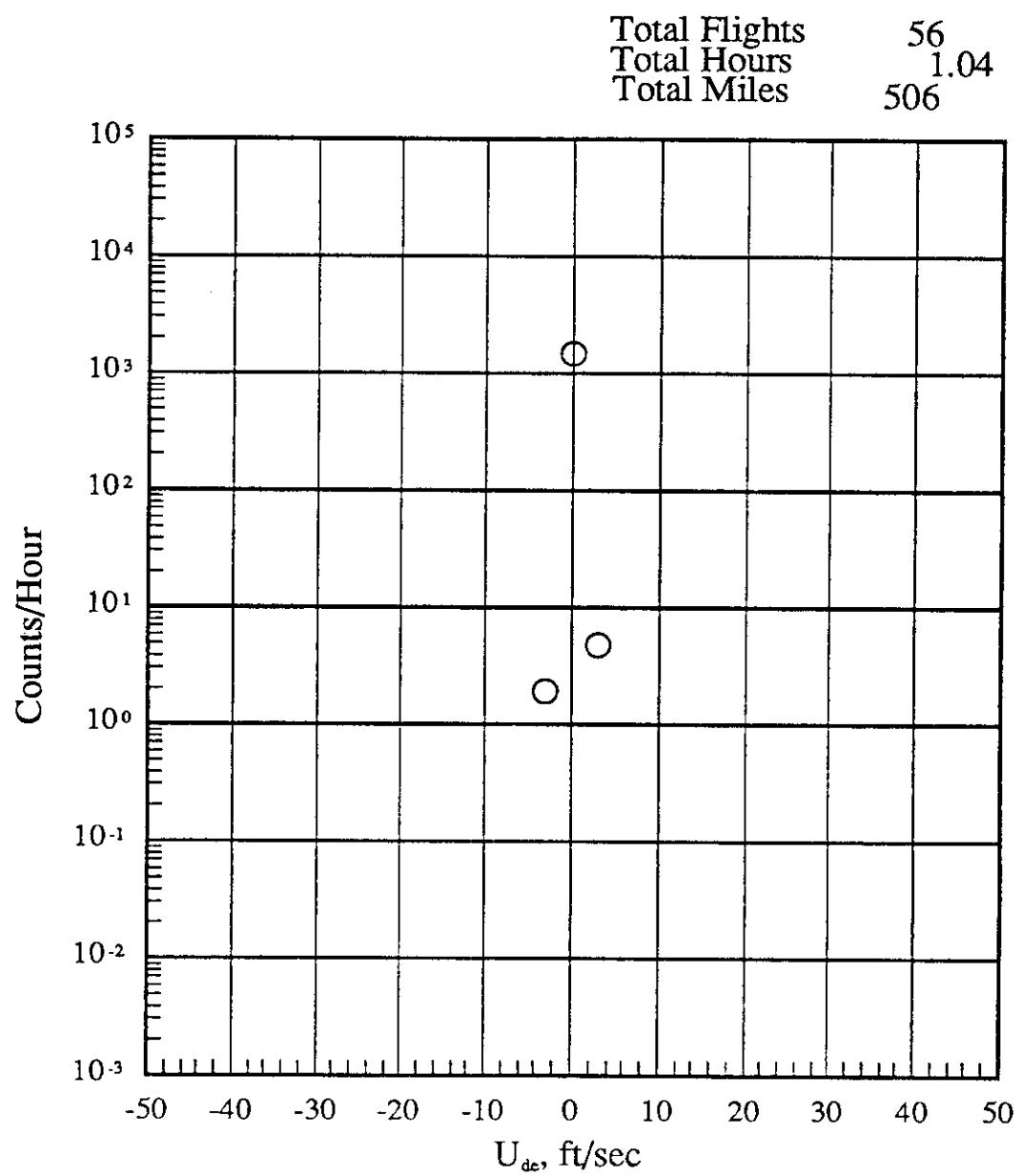
(e) 14500 to 19500 feet altitude

Figure 24.- Continued.



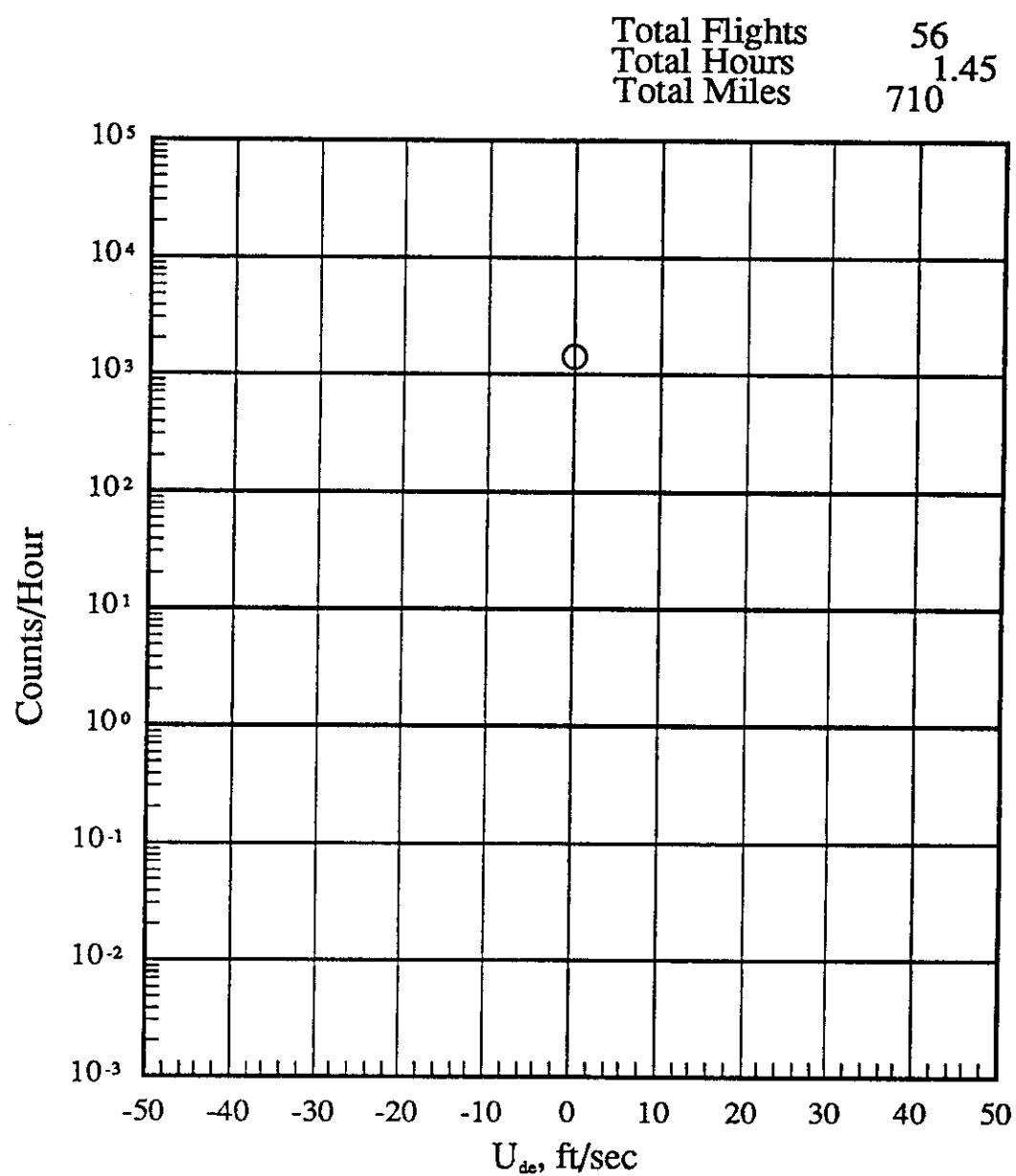
(h) 29500 to 34500 feet altitude

Figure 24.- Continued.



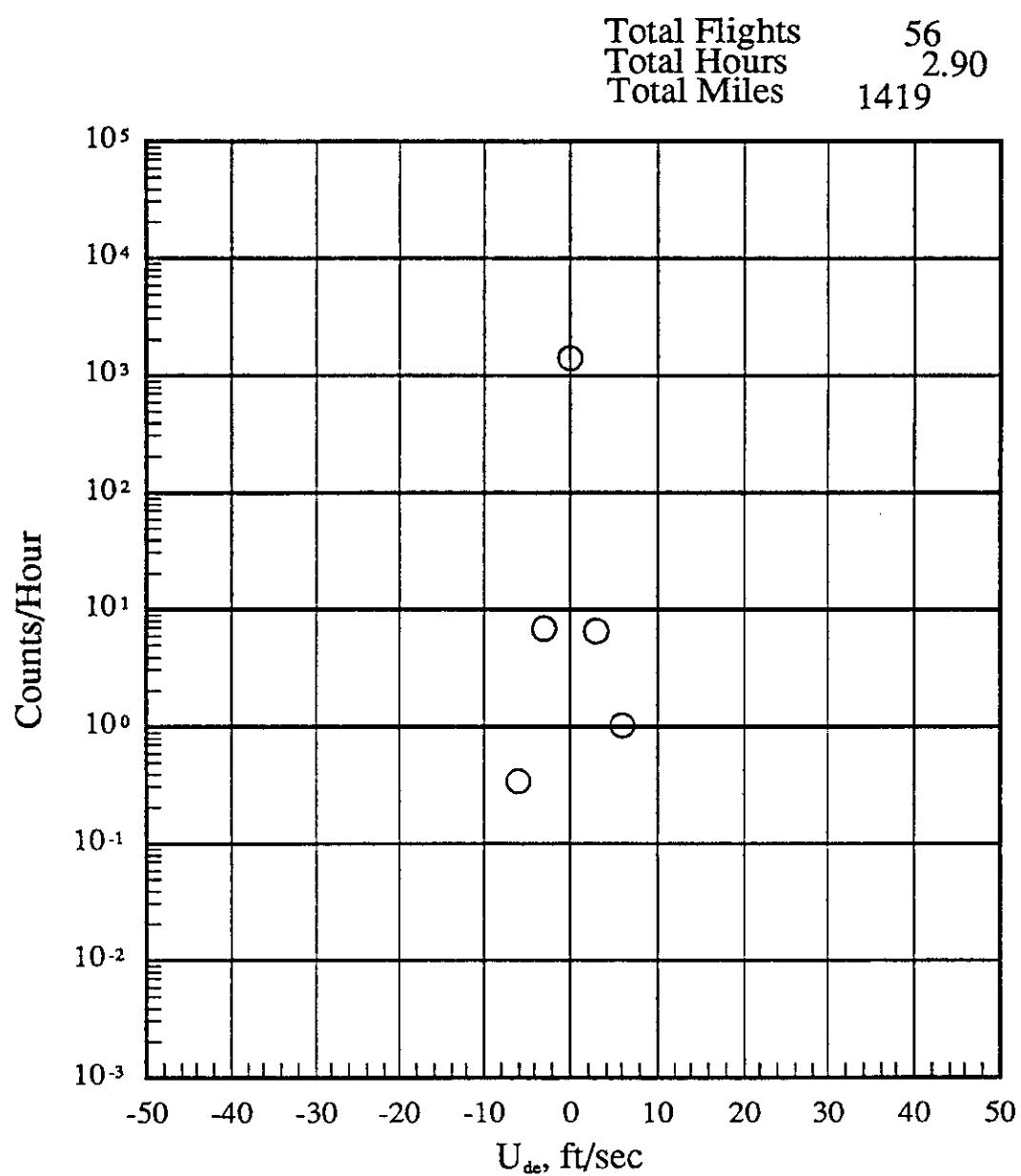
(g) 24500 to 29500 feet altitude

Figure 24.- Continued.



(j) 39500 to 44500 feet altitude

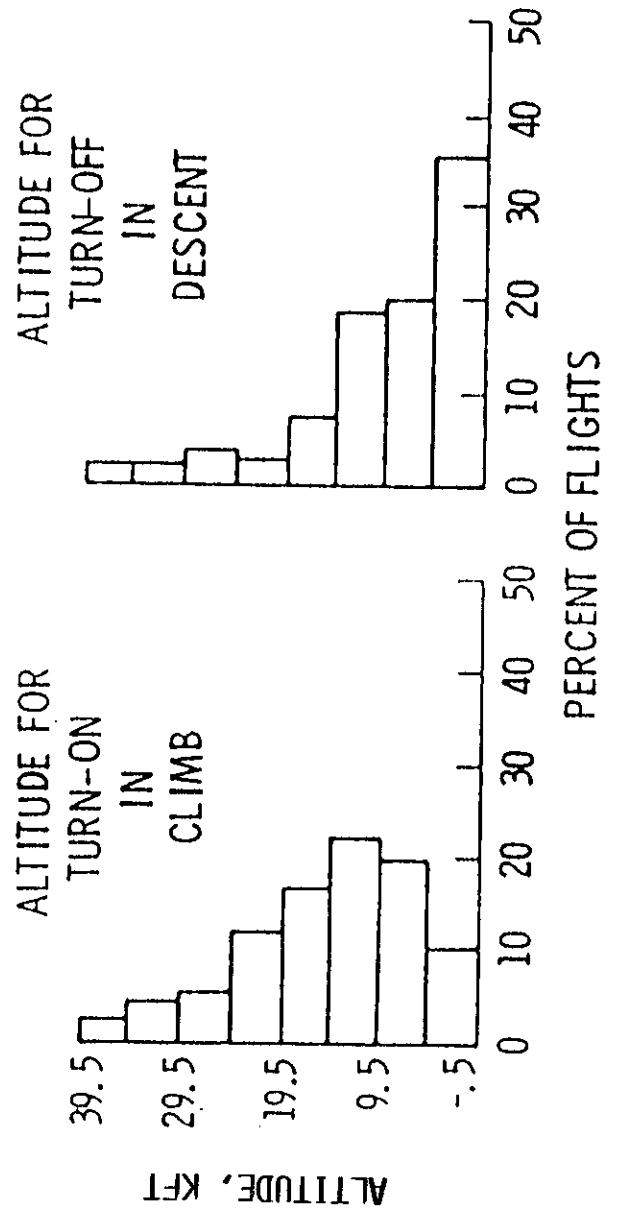
Figure 24.- Continued.



(i) 34500 to 39500 feet altitude

Figure 24.- Continued.

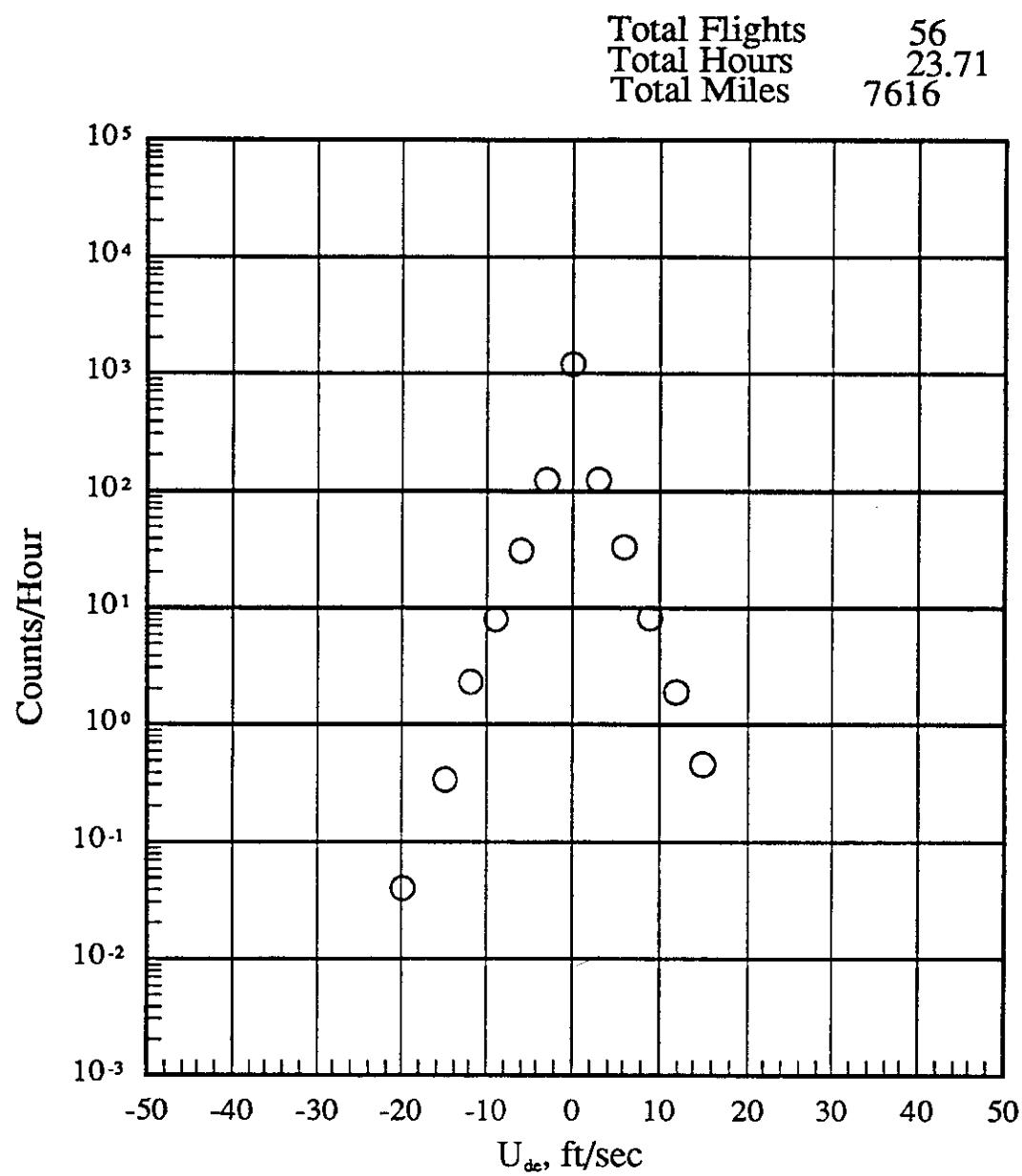
L-1011 FOR 373 HOURS OF REVENUE FLIGHTS  
1978



SUMMARY

- AUTOPILOT WAS "ON" ABOUT 75% OF THE TIME
- AUTOPILOT WAS "ON" AT TOUCHDOWN FOR 5% OF THE FLIGHTS
- AUTOPILOT WAS NOT USED ON 8% OF THE FLIGHTS

Figure 25. - Autopilot on-off statistics.



(k) -500 to 44500 feet altitude

Figure 24.- Concluded.

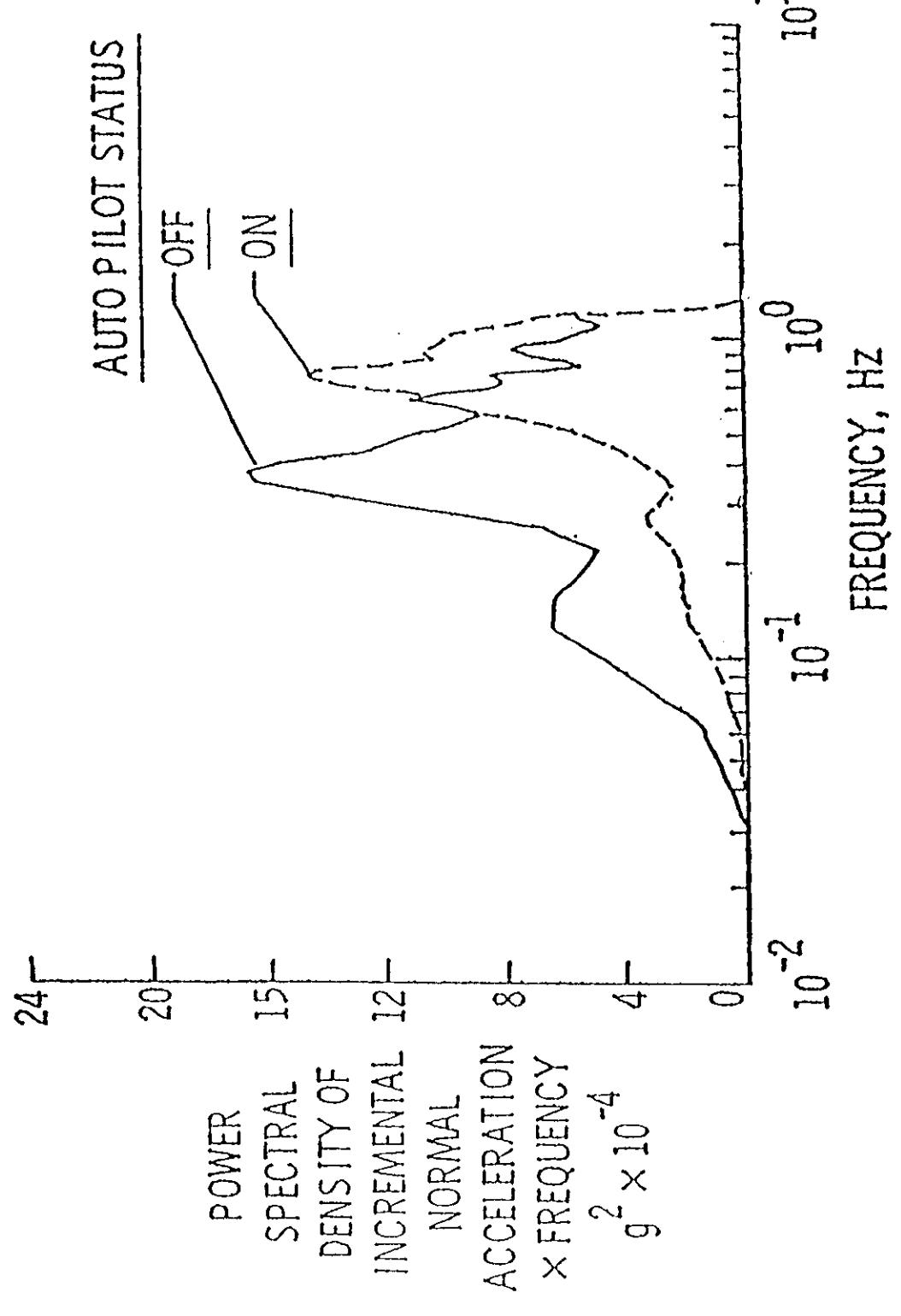
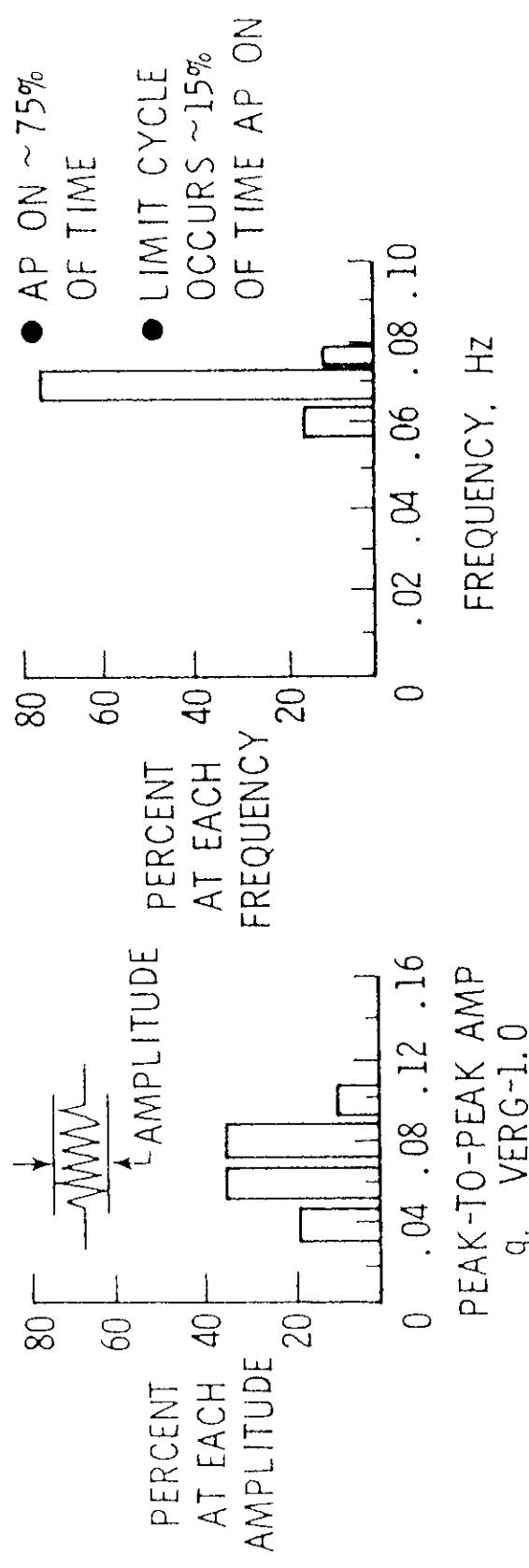
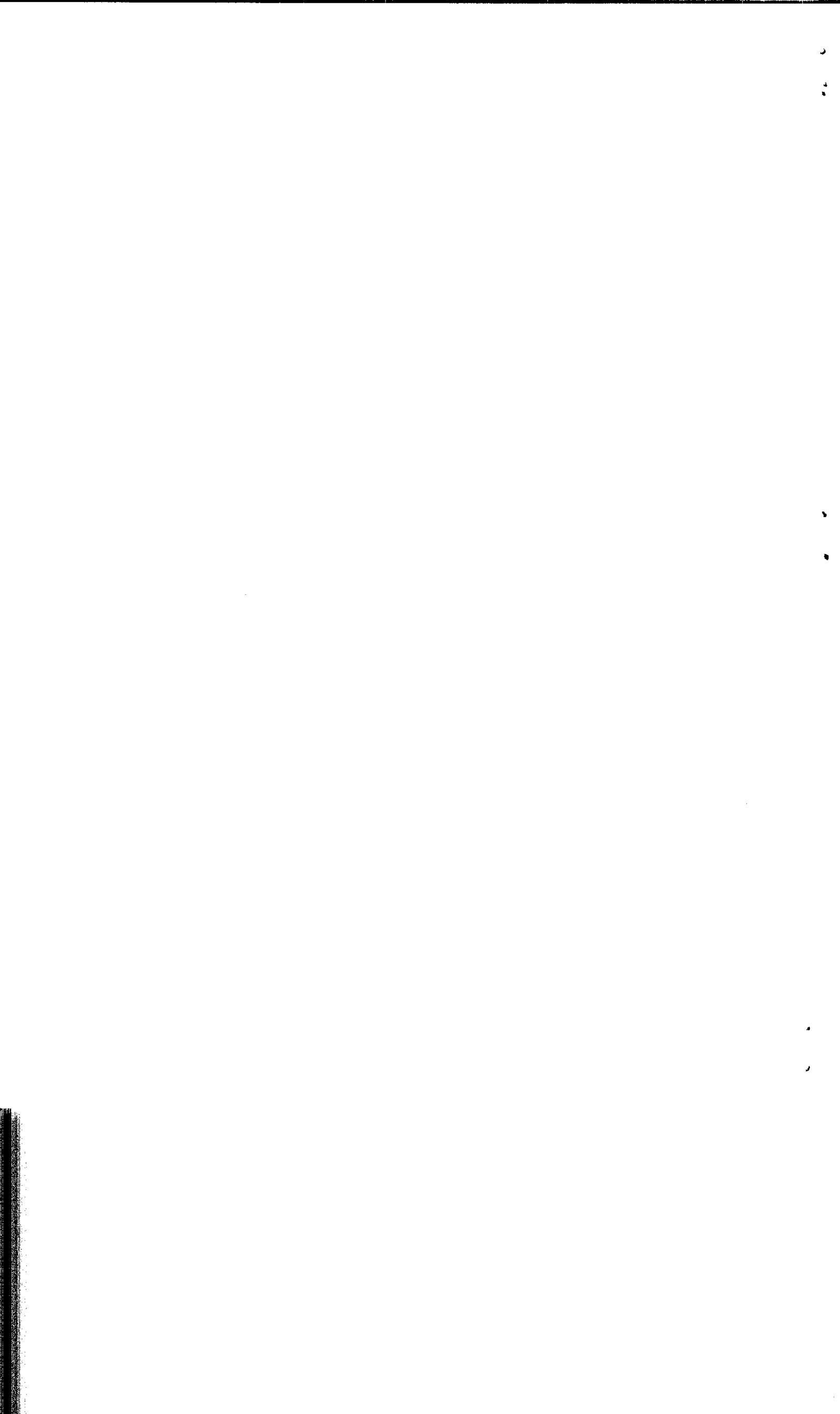


FIGURE 27.— Effect of autopilot on normal acceleration power spectra.



DATA FROM 373 HOURS L-1011 1978

Figure 26.- Autopilot "limit cycle" experience.





## Report Documentation Page

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